TOSHIBA

FILE NO. 030-9601

SERVICE MANUAL

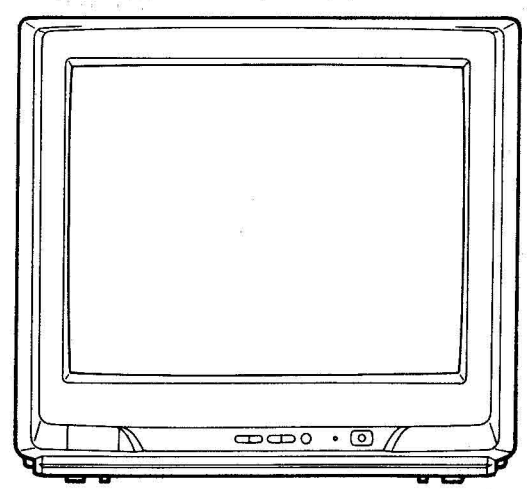
COLOUR TELEVISION

C4E-R Chassis

2150RN

– SUMMARY –

2150RN is the same as 2150TN except for the following parts.
Use this service manual together with the original service manual 2150TN File No. 030-9526.



PRINTED IN JAPAN, Jan., 1996 (So)

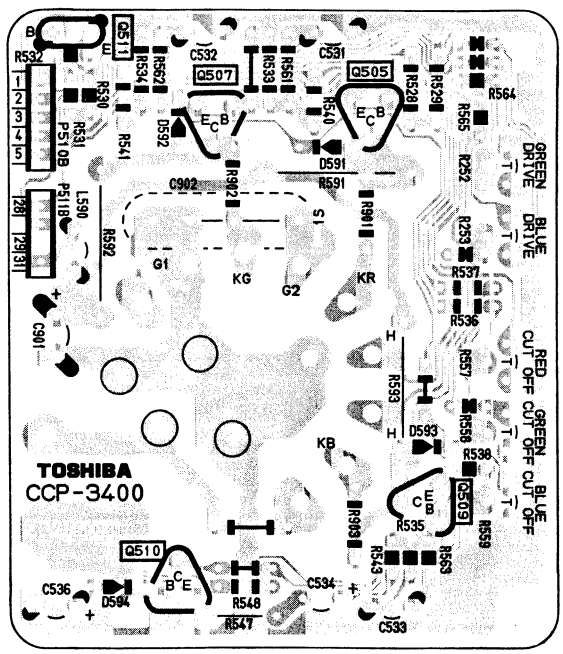
REPLACEMENT PARTS LIST DIFFERENCES

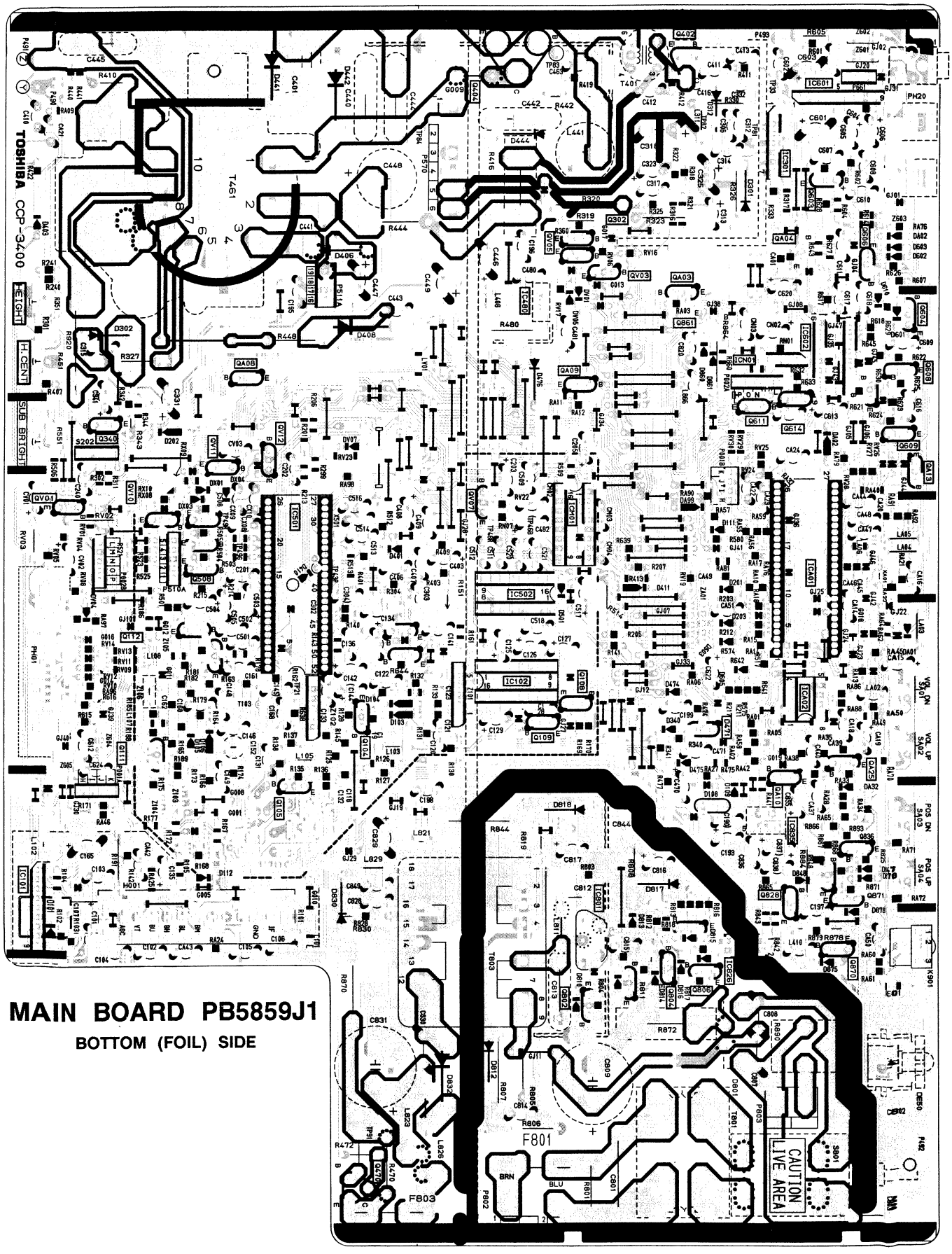
2150RN is not equipped with Teletext circuit, and the related parts are changed as well.

Location No.	2150TN (Base model)		2150RN	
	Part No.	Description	Part No.	Description
U902A	23704923	Main Board, PB5860D1	23704830	Main Board, PB5859J1
U902B	23704924	CRT Drive Board, PB5860D2	23704940	CRT Drive Board, PB5859J2
CA22	24590104	PF, 0.1μF	–	Not in use
CA23	24590104	PF, 0.1μF	–	Not in use
CA24	24590104	PF, 0.1μF	–	Not in use
CA44	24794470	EL, 47μF, ±20%, 16V	–	Not in use
CA47	24212103	CD, 0.01μF, ±10%	24473220	CD, 22pF
CA48	24232103	CD, 0.01μF, +80%, -20%	24473220	CD, 22pF
CA51	24474101	CD, 100pF, ±10%	–	Not in use
R509	24366433	CF, 43k ohm	24366183	CF, 18k ohm
R574	24366153	CF, 15k ohm	24366622	CF, 6200 ohm
R575	24366103	CF, 10k ohm	24366133	CF, 13k ohm
R581	24366102	CF, 1k ohm	–	Not in use
R864	24382560	OMF, 56 ohm, 1W	–	Not in use
R870	24383103	OMF, 10k ohm, 2W	24383822	OMF, 8200 ohm, 2W
RA14	–	Not in use	24366102	CF, 1k ohm
RA15	–	Not in use	24366102	CF, 1k ohm
RA16	–	Not in use	24366102	CF, 1k ohm
RA18	–	Not in use	24366561	CF, 560 ohm
RA35	24366223	CF, 22k ohm	24366471	CF, 470 ohm
RA36	24366102	CF, 1k ohm	–	Not in use
RA37	24366273	CF, 27k ohm	–	Not in use
RA40	24366102	CF, 1k ohm	–	Not in use
RV24	24366621	CF, 620 ohm	–	Not in use
RV25	24366621	CF, 620 ohm	–	Not in use
RV26	24366101	CF, 100 ohm	24366391	CF, 390 ohm
RV27	24366101	CF, 100 ohm	24366391	CF, 390 ohm
RV28	24366101	CF, 100 ohm	24366391	CF, 390 ohm
RV29	24366681	CF, 680 ohm	–	Not in use
RV30	24366681	CF, 680 ohm	–	Not in use
RX08	24366391	CF, 390 ohm	24366222	CF, 2200 ohm
RX09	24366391	CF, 390 ohm	24366222	CF, 2200 ohm
RX10	24366391	CF, 390 ohm	24366222	CF, 2200 ohm
LA04	23103859	Coil (Ferrite Bead), TEM2011	–	Not in use
LA05	23103859	Coil (Ferrite Bead), TEM2011	–	Not in use
LA06	–	Not in use	23238708	Coil, Peaking, TRF4330AJ
D860	23316674	Diode, Zener, MTZJ6.2A	–	Not in use
Q861	A6333346	Transistor, 2SC2655-Y(C)	–	Not in use
K902	23306084	Remote Hand Unit, CT-9784	23120954	Remote Hand Unit, CT-9736
A201	23410243	Front Cover	23410241	Front Cover
A401	23425816	Back Cover	23426841	Back Cover
A411	23569007	Label, Model No., B/C	23569876	Label, Model No., B/C

CRT DRIVE BOARD PB5859J2

BOTTOM (FOIL) SIDE





MAIN BOARD PB5859J1

BOTTOM (FOIL) SIDE

SCHEMATIC DIAGRAM MODEL: 2150RN

CAUTION: The international hazard symbols "⚠" in the schematic diagram and the parts list designate components which have special characteristics important for safety and should be replaced only with types identical to those in the original circuit or specified in the parts list. The mounting position of replacements is to be identical with originals. Before replacing any of these components, read carefully the PRODUCT SAFETY NOTICE on page 2. Do not degrade the safety of the receiver through improper servicing.

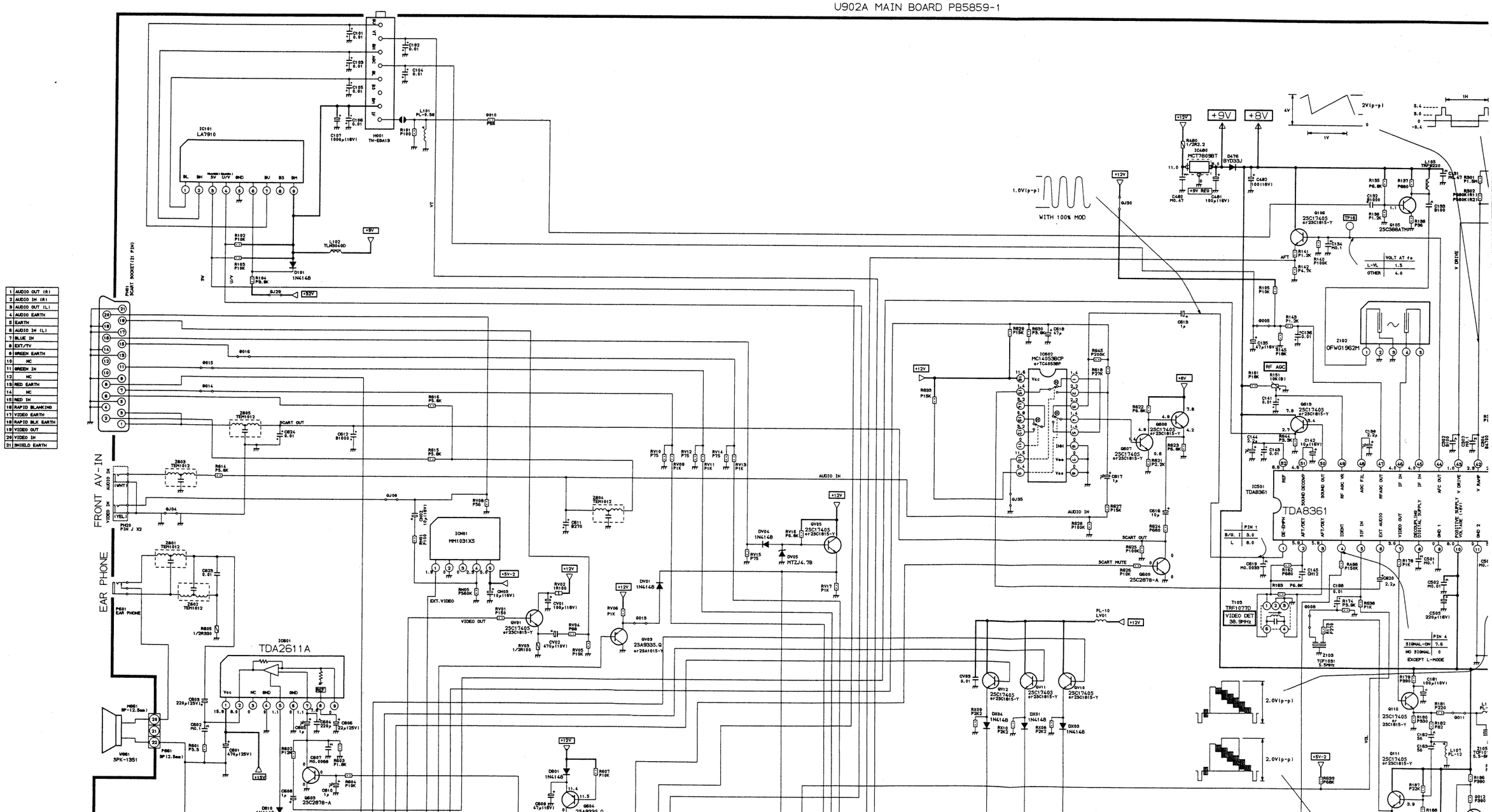
OBSERVATION OF VOLTAGES AND WAVEFORMS

1. Voltages read with VTVM from point shown to chassis ground, line voltage 220 volts, colour bar signal. Voltages reading may vary ±20%.
2. All waveforms are taken using a wide band oscilloscope and a low capacity probe.
3. Waveforms are taken using a standard colour bar signal.
4. Make sure that CONTRAST and COLOUR controls are in mid position and BRIGHTNESS control is almost in maximum position. Set other controls for best picture.

NOTES:

1. D.C. resistance v
   gram. These are r
2. The circuits are su
3. ● : Solder link

U902A MAIN BOARD PB5859-1



PRIMARY CIRCUIT

SECONDARY CIRCUIT

CAUTION
LIVE AREA

EAR PHONE

SHIELD

PB3C05S/BBP/158

TDA2611A

VIDEO DET

EXT. VIDEO

INT. VIDEO

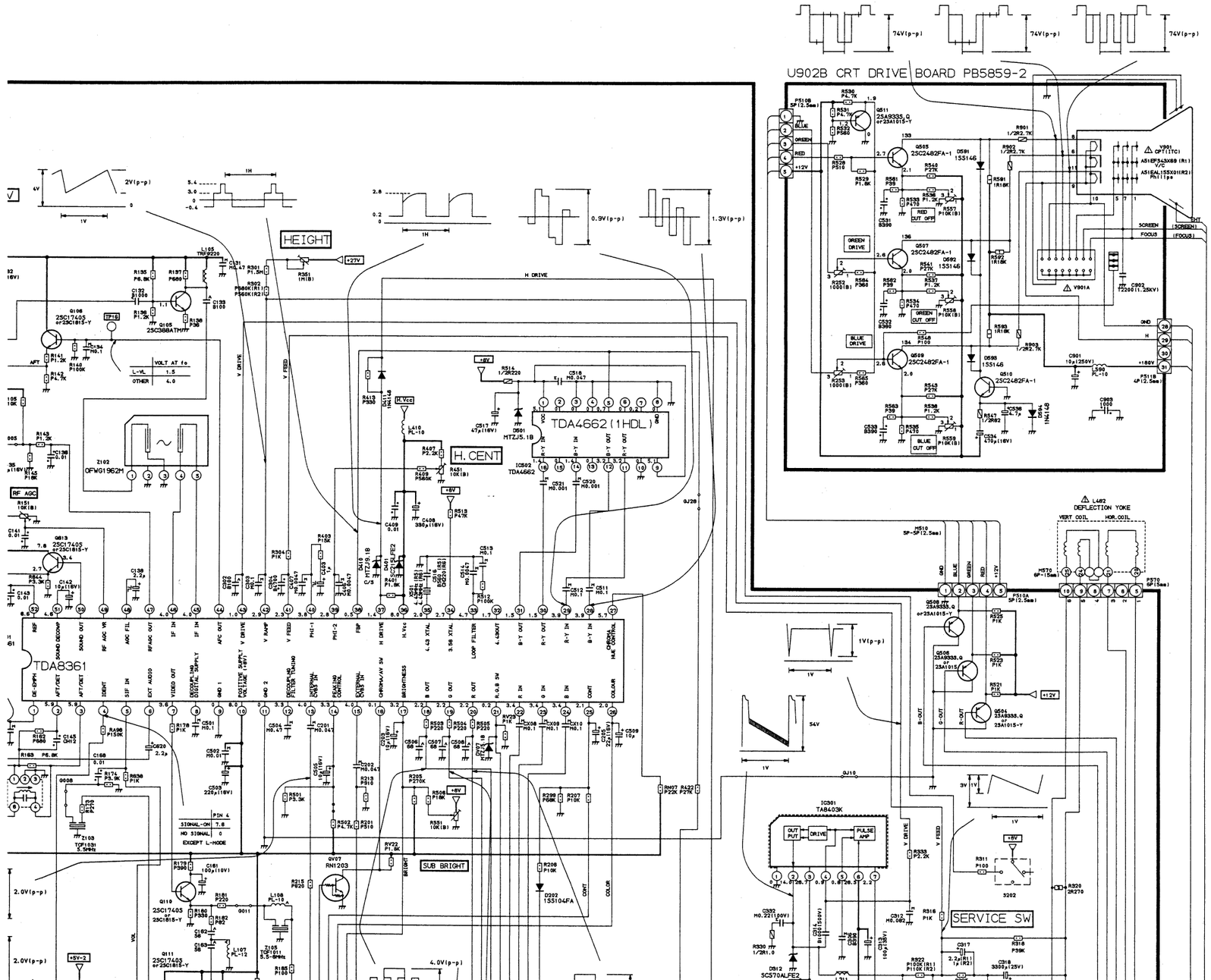
NOTES:

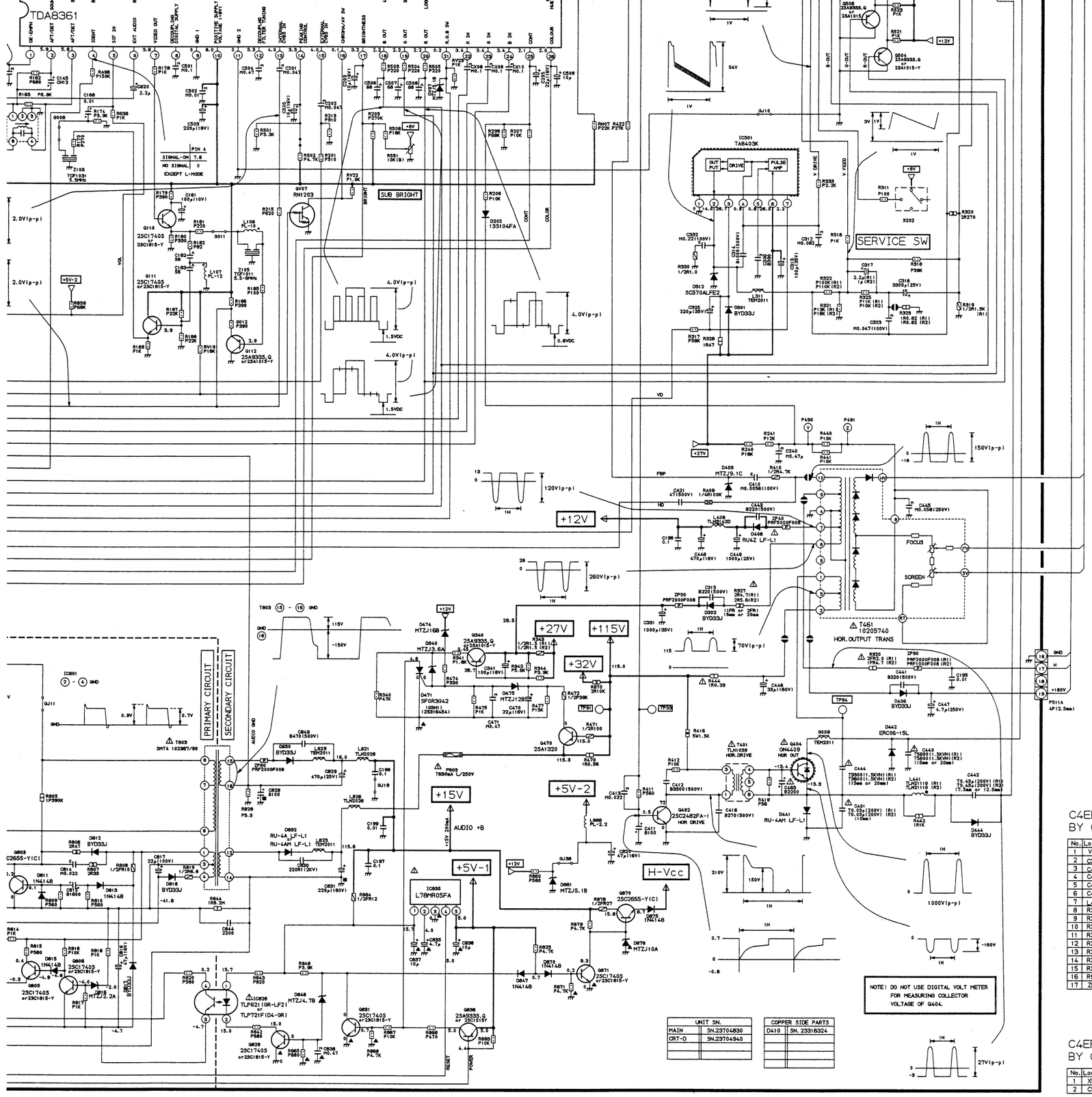
1. D.C. resistance value of a principal transformer is shown in this schematic diagram. These are measured for separated from the circuit.
2. The circuits are subject to change without notice.
3. ⊖ : Solder links.

EXPRESSION

VALUE OF RESISTOR, CAPACITOR and INDUCTOR

1. Resistance is shown in ohm, k=1,000, M=1,000,000
2. Unless other wise noted in schematic, all capacitor values less than 1 are expressed in μF and the values more than 1 in pF.
3. Unless otherwise noted in schematic, all inductor values more than 1 are expressed in μH, and the values less than 1 in H.





UNIT SN.	
MAIN	SN.23704830
CRT-D	SN.23704940

COPPER SIDE PARTS	
D410	SN. 23316324

C4ER CIRCUIT SPEC CONPONENT VALUES BY CPT TYPE

No.	Loc.No.	R1	R2
1	V901	A51EF543X69(VIDEO COLOR)	A51EAL155X01(PHILIPS)
2	C317	T2.2μ	T1μ
3	C401	T0.03μ(200V)	T0.03μ(200V)
4	C440	T5600(1.5KVH)	T5600(1.5KVH)
5	C442	T0.43μ(200V)	T0.43μ(200V)
6	C444	T3300(1.5KVH)	T3600(1.5KVH)
7	L441	TLN2111G	TLN2111G
8	R302	P680K	P560K
9	R319	1/2R2.7K	NOT REQ'D
10	R321	P13K	P16K
11	R322	P100K	P110K
12	R323	1R0.82	1R0.82
13	R325	P11K	P10K
14	R327	P4.7	P5.6
15	R343	1/2R1.5	1/2R1.5
16	R920	2FR2.0	1FR4.7
17	ZP90	PRF2000F008	PRF1000F008

C4ER CIRCUIT SPEC COMPONENT VALUES BY CRYSTAL TYPE(SUPPLIER)

No.	Loc.No.	R5	R6
1	X501	4.43MHz (N.D.K.)	4.43MHz (PHILIPS)
2	C516	B560	CH220

TOSHIBA

FILE NO. 030-9526

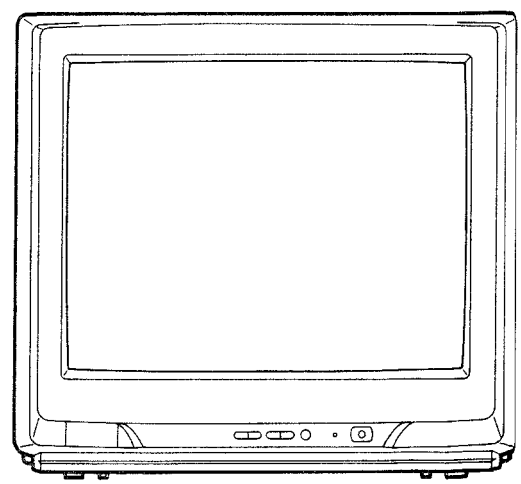
TOSH- 01989

SERVICE MANUAL

COLOUR TELEVISION

C4E-R Chassis

2150TN



PRINTED IN JAPAN, Dec ., 1985 (So)

1989

SAFETY INSTRUCTIONS

WARNING: BEFORE SERVICING THIS CHASSIS, READ THE "X-RAY RADIATION PRECAUTION", "SAFETY PRECAUTION" AND "PRODUCT SAFETY NOTICE" INSTRUCTIONS BELOW.

X-RAY RADIATION PRECAUTION

1. The E.H.T. must be checked every time the receiver is serviced to ensure that the C.R.T. does not emit X-ray radiation as result of excessive E.H.T. voltage. The nominal E.H.T. for this receiver is 28.6 kV at zero beam current (minimum brightness) operating at 220V a.c. The maximum E.H.T. voltage permissible in any operating circumstances must not exceed 29.5 kV. When checking the E.H.T., use the 'High Voltage Check' procedure in this manual using an accurate E.H.T. voltmeter.
2. The only source of X-RAY radiation in this receiver is the C.R.T. To prevent X-ray radiation, the replacement C.R.T. must be identical to the original fitted as specified in the Parts List.
3. Some components used in this receiver have safety related characteristics preventing the C.R.T. from emitting X-ray radiation.
   For continued safety, replacement component should only be made after referring the Product Safety Notice below.

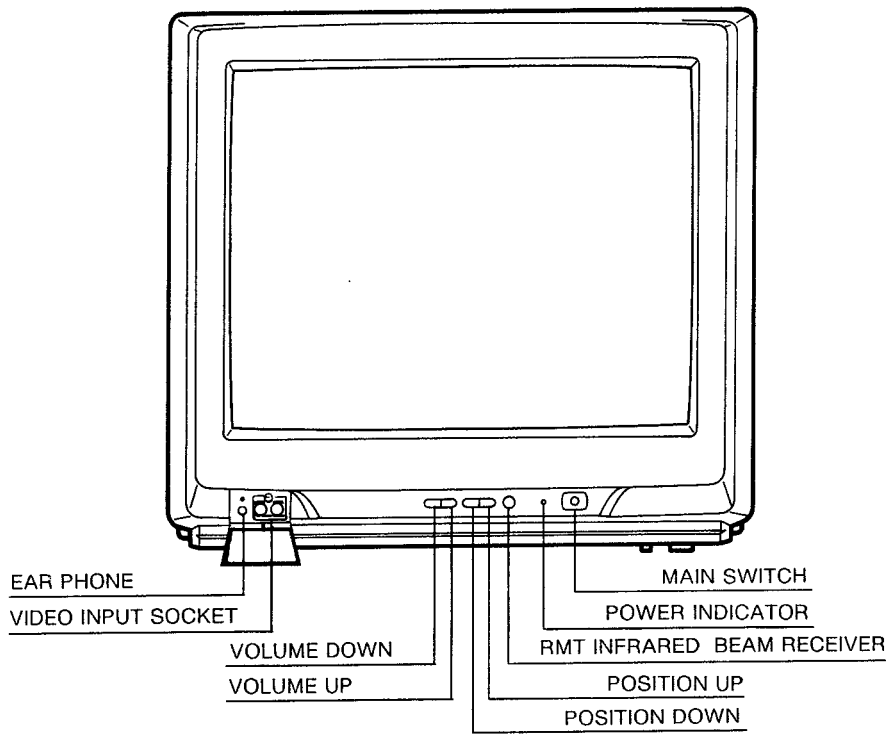
SAFETY PRECAUTION

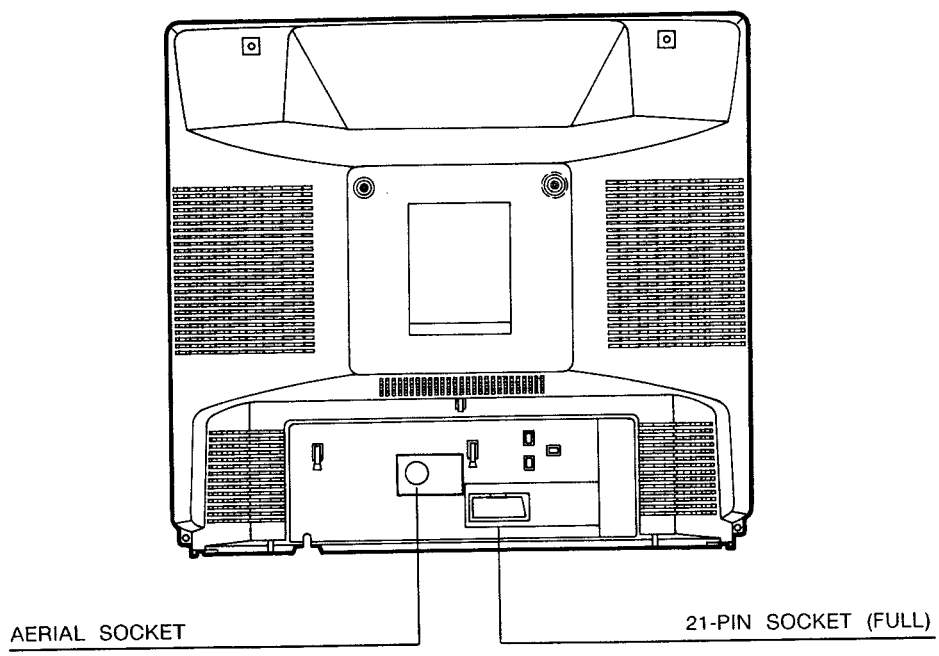
1. This receiver has a nominal working E.H.T. voltage of 26.0 kV. Extreme caution should be exercised when working on the receiver with the back removed.
   Do not attempt to service this receiver if you are not conversant with the precautions and procedures for working on high voltage equipment.
   When handling or working on the C.R.T., always discharge the anode to the receiver chassis before removing the anode cap
   The C.R.T., if broken, will violently expel glass fragments. Use shatter proof goggles and take extreme care while handling.
   Do not hold the C.R.T. by the neck as this is a very dangerous practice.
2. It is essential that to maintain the safety of the customer all cable forms be replaced exactly as supplied from factory.
3. A small part of the chassis used in this receiver is, when operating, at approximately half mains potential at all times. It is therefore essential in the interest of safety that when serving or connecting any test equipment the receiver should be supplied via a suitable isolating transformer of adequate rating.
4. Replace blown fuses within the receiver with the fuse specified in the parts list.
5. When replacing wires or components to terminals or tags, wind the leads around the terminal before soldering. When replacing safety components identified by the international hazard symbols on the circuit diagram and parts list, it must be a Toshiba approved type and must be mounted as the original.
6. Keep wires away from high temperature components.

PRODUCT SAFETY NOTICE

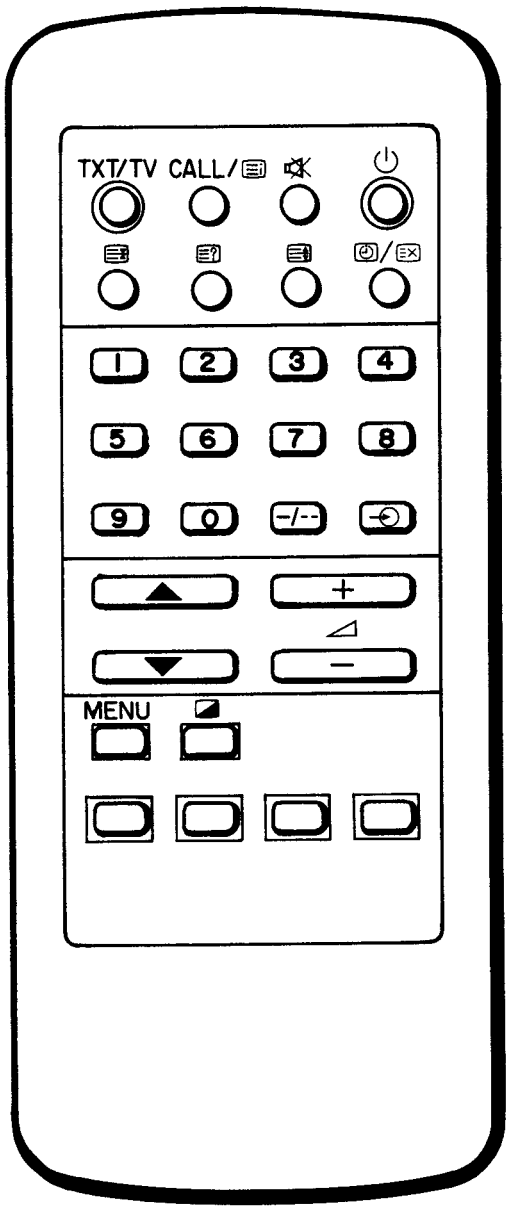
Many electrical and mechanical components in this chassis have special safety-related characteristics. These characteristics are often passed unnoticed by a visual inspection and the X-ray radiation protection afforded by them cannot necessarily be obtained by using replacements rated at higher voltages or wattage, etc. Components which have these special safety characteristics in this manual and its supplements are identified by the international hazard symbols on the schematic diagram and parts list. Before replacing any of these components read the parts list in this manual carefully. Substitute replacement components which do not have the same safety characteristics as specified in the parts list may create X-ray radiation.

FRONT CONTROLS AND REAR VIEWS





REMOTE HAND HELD UNIT



CT-9784

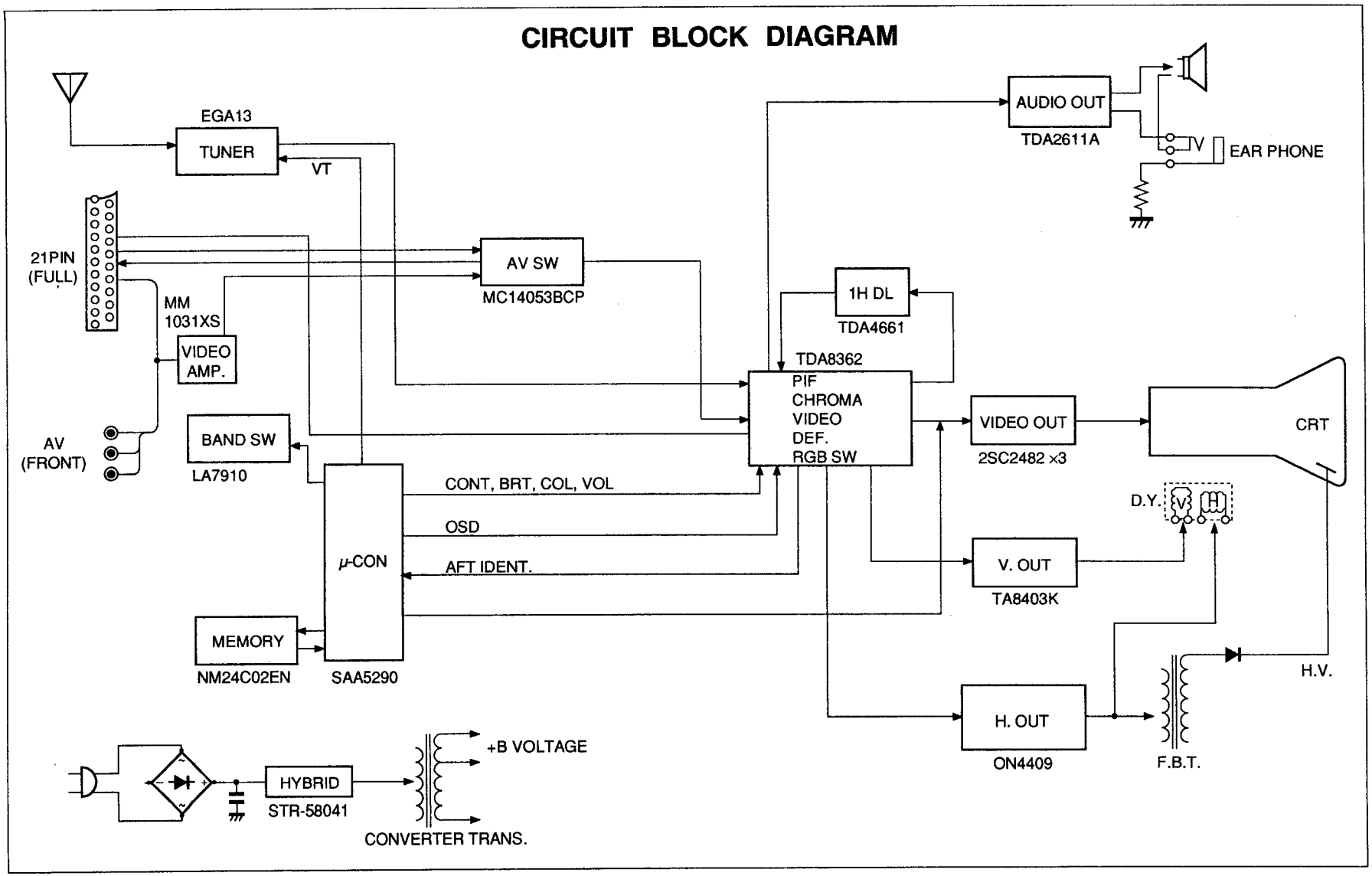
KEY ASSIGNMENT

- ⏻ ..... ON/STAND-BY
- 🔇 ..... MUTE
- CALL ..... DISPLAY CALL
- MENU..... TUNING & OTHER MENU
- ◪ ..... PICTURE MENU
- 1~9, 0 ... TEN KEY
- - / - - ..... 1 or 2 place
- ⏻ ..... VIDEO INPUT (EXTERNAL INPUT SOURCE SW.)
- ◿ ..... VOLUME
- \+ ..... LEVEL PLUS (VOLUME, MENU)
- − ..... LEVEL MINUS (VOLUME, MENU)
- ▲ ..... UP (POSI., CH., TEXT PAGE)
- ▼ ..... DOWN (POSI., CH., TEXT PAGE)

TELE-TEXT

- TXT/TV..... TEXT, MIX, TV MODE SW.
- ..... HOLD
- ..... <TEXT MODE> ..... REVEAL / CONCEAL
- ..... <TEXT MODE> ..... F-T-B (FULL, TOP, BOTTOM)
- /EX ..... TIME DISPLAY (TV MODE) TEXT CLEAR (TEXT MODE)
- ..... INDEX, INITIAL
- FLOF COLOUR KEY (4 key used) Red/Green/Yellow/Blue

CIRCUIT BLOCK DIAGRAM



WARNING: BEFORE SERVICING THIS CHASSIS, READ THE "X-RAY RADIATION PRECAUTION", "SAFETY PRECAUTION" AND "PRODUCT SAFETY NOTICE" ON PAGE 2 OF THIS MANUAL.

INSTALLATION AND SERVICE ADJUSTMENTS

GENERAL INFORMATIONS

All adjustments are thoroughly checked and corrected when the receiver leaves the factory. Therefore the receiver should operate normally and produce proper colour and B/W pictures upon installation. However, several minor adjustments may be required depending on the particular location in which the receiver is operated.
This receiver is shipped completely in cardboard carton. Carefully draw out the receiver from the carton and remove all packing materials.
Plug the power cord into a convenient 220 volts 50 Hz AC two pin power outlet. Turn the receiver ON. Check and adjust all the customer controls such as BRIGHTNESS, CONTRAST and COLOUR Controls to obtain natural colour or B/W picture.

AUTOMATIC DEGAUSSING

A degaussing coil is mounted around the picture tube so that external degaussing after moving the receiver is normally unnecessary, providing the receiver is properly degaussed upon installation. The degaussing coil operates for about 1 second after the power to the receiver is switched ON. If the set is moved or faced in a different direction, the power switch must be switched off at least 30 minutes in order that the automatic degaussing circuit operates properly. Should the chassis or parts of the cabinet become magnetized to cause poor colour purity, use an external degaussing coil. Slowly move the degaussing coil around the faceplate of the picture tube, the sides and front of the receiver and slowly withdraw the coil to a distance of about 2 m before disconnecting it from AC source. If colour shading still persists, perform the COLOUR PURITY ADJUSTMENT and CONVERGENCE ADJUSTMENTS procedures.

HIGH VOLTAGE CHECK

CAUTION: There is no HIGH VOLTAGE ADJUSTMENT on this chassis.

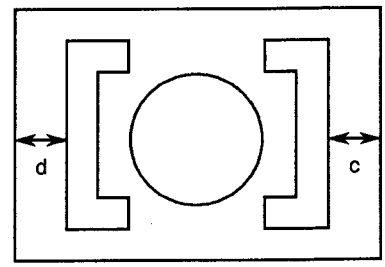
1. Connect an accurate high voltage meter to the second anode of the picture tube.
2. Turn on the receiver. Set the BRIGHTNESS and CONTRAST Controls to minimum (zero beam current).
3. High voltage will be measured below 29.5 kV.
4. Rotate the BRIGHTNESS Control to both extremes to be sure the high voltage does not exceed the limit of 29.5 kV under any conditions.

HEIGHT ADJUSTMENT

1. Receive the WG PHILIPS pattern, and set the contrast and colour to minimum, and the brightness to centre.
2. Adjust HEIGHT Control (R351) so that white blocks at top and bottom of the picture are just masked.

HORIZONTAL CENTRE ADJUSTMENT

1. Receive the WG PHILIPS pattern.
2. Set the contrast and colour to minimum, and the brightness to centre.
3. Adjust H. CENTER SUB Control (R451) so the pattern can be located for d-c to be +4.0 mm.



FOCUS ADJUSTMENT

Adjust FOCUS Control on FLYBACK TRANS. (T461) for well defined scanning lines in the centre area on the screen.

DELAYED R-F AGC ADJUSTMENT

1. Tune the set in the strongest station in your area.
2. Turn AGC DELAY Control (R151) on MAIN Board to fully counterclockwise position.
3. Adjust AGC DELAY Control clockwise until noise (snow) disappears on the screen.

CRT GREY SCALE ADJUSTMENT

1. Press VIDEO INPUT button on Remote Control unit to turn TV to video input mode. (Video input should have no signal.) Next press PICTURE SELECT button to select function and set CONTRAST to minimum, BRIGHTNESS to maximum, COLOUR to minimum.
2. Turn the SCREEN Control (on T461) fuly counter-clockwise.
3. Set the RED, GREEN and BLUE CUT OFF Controls (R557, R558, R559) counterclockwise to the centre position.
4. Set the GREEN and BLUE DRIVE Controls (R252, R253) to the centre position.
5. Set the CUT OFF SW. (S202) in the H. line position.
6. Set the SUB BRIGHTNESS Control to minimum.
7. Rotate the SCREEN Control gradually clockwise until the first horizontal line of a colour (RED, GREEN or BLUE) appears slightly on the screen. Set the SCREEN Control to this position.
8. Adjust the CUT OFF Controls to obtain the slightly lighted horizontal lines in the same levels of three colours (RED, GREEN and BLUE). The lines may look like white if the CUT OFF Controls are adjusted properly.
9. Return the CUT OFF SW. (S202) in the receiving position. Press VIDEO INPUT button to turn TV to the TV mode.
10. Set the BRIGHTNESS Control to the maximum and COLOUR Control to the centre.
11. Adjust the BLUE and GREEN DRIVE Controls (R252/R253) to obtain proper white-balanced picture in high light areas.
12. Set the BRIGHTNESS and CONTRAST Controls to obtain dark grey raster. Then check the white balance in low brightness. If the white balance is not proper, retouch the CUT OFF Controls and DRIVE Controls to obtain a good white balance in both low and high light areas.

SUB-BRIGHTNESS ADJUSTMENT

1. Tune in a colour programme of Philips pattern.
2. Set the CONTRAST Control to the minimum and the BRIGHTNESS Control to the centre.
3. Set the COLOUR Control to the minimum.
4. Set the SUB-BRIGHT. Control (R551) so that the voltage across terminals Y-Z can be 0.2 ± 0.05V with voltmeter and leave the receiver for five minutes in this state.
5. Watching the picture well, adjust the SUB-BRIGHT. Control in the position where the picture does not show evidence of blooming in high bright area and not appear too dark in low bright portion.
6. Check the proper picture variation by rotating the CONTRAST and BRIGHTNESS Controls to both extremes.
7. If the picture does not appear dark with the CONTRAST and BRIGHTNESS Controls turned to the minimum, or not appear bright with the controls turned to the maximum, adjust the SUB-BRIGHT. Control again for the acceptable picture.

BUS DATA SETTING

1. In the TV set of initial lot of production, SAA5290ZP/024 is used for QA01. But replace with SAA5290ZP/032 for servicing.
2. When QA01 only is replaced, it is not necessary to change the mode data.
3. When memory IC (QA02) is replaced, change the mode data in the manner below.

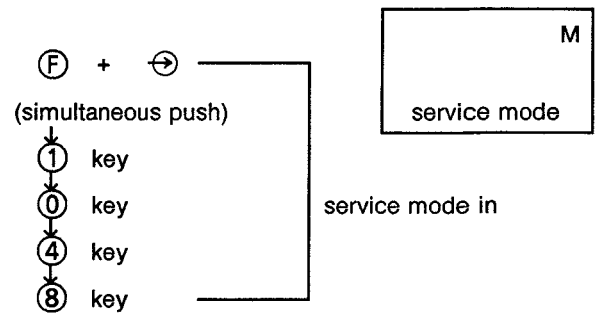
ADJUSTMEN METHOD FOR SERVICING

1.OUTLINE

In the service mode, MODE DATA adjustments can be made easily with user remote control unit. (CT-9689 only)

2.SERVICE MODE OPERATION

2-1. How to Enter the Service Mode



2-2. How to Exit from the Service Mode

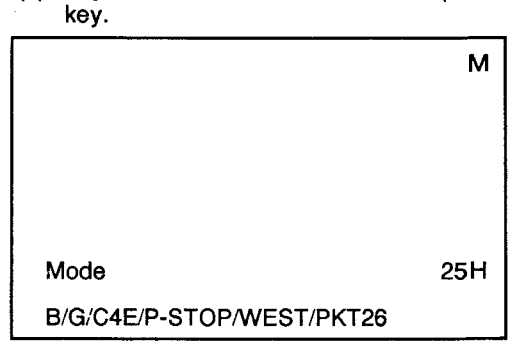
Exit the service mode by turning the power on/off with the remote control.

3. ADJUSTMENT IN THE SERVICE MODE

Service Mode Level Adjustments

(1) Push Ⓕ + ◪ key (simultaneous push) to appear Mode Data to be adjusted.

(2) Adjust with the level UP/DOWN (VOL UP/DOWN) key.



Example of screen display in level adjustment

PICTURE I-F ALIGNMENT

GENERAL ..... Refer to figure 4 for test equipment connection.
PRELIMINARY STEPS ..... Supply +5 volts to the 5V-1 line.
SIGNAL GENERATOR ..... Connect to both leads of R101 with signal level of 75 dBμ, and open the solder-link at IF OUT of tuner on the Main Board. (See figure 4.)
DVM ..... Connect to pin #44 of IC501 on the Main Board through the detector.

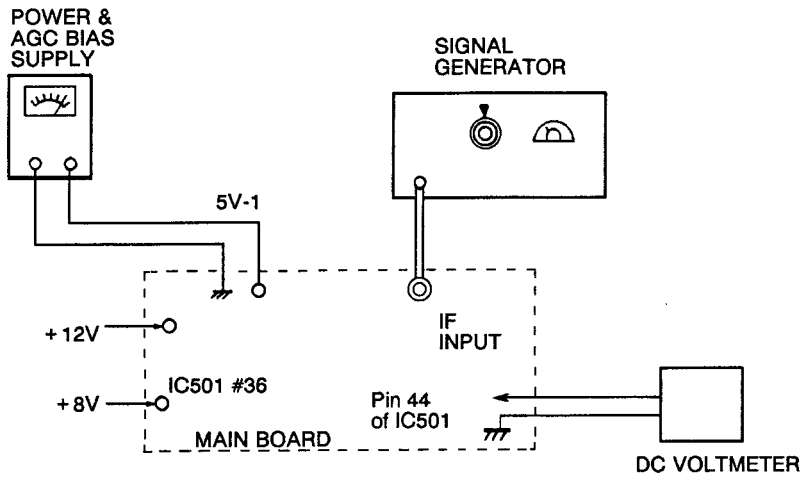


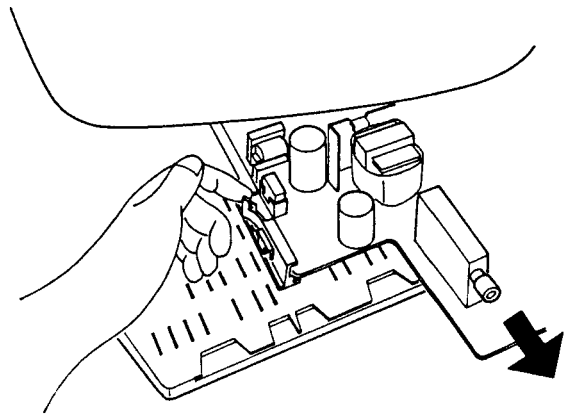
Figure 4. Picture IF Alignment

STEP	SIGNAL GENERATOR	ADJUST	REMARKS
Detector Coil	38.9 MHz CARRIER WAVE (Level 75 dBμ)	T103	1. Supply external DC power (+5V) to 5V-1 line. 2. Supply +8V to pin 36 of IC501. 3. Supply external DC power to +12V line. 4. Apply test signal to IF input. 5. Adjust T103 so that DC voltage at pin 44 of IC501 becomes 3.5V ± 0.5V.
After completing the above steps, disconnect the equipment and re-solder the links on the Main Board, and adjust the AGC Delay Control (R151) following DELAYED RF AGC ADJUSTMENTS.			

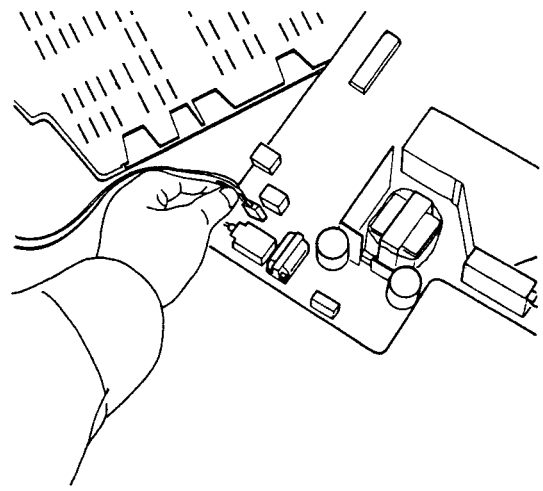
2150 SERIES : SERVICE POSITION INFORMATION

When repairing the units of 2150 Series, make sure to retain the chassis in the following procedure.

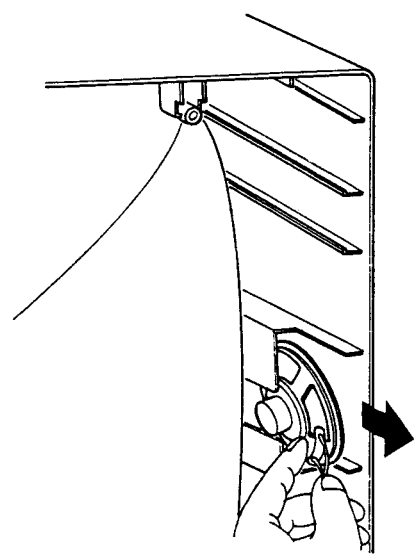
1. Open the hook at the left of the rail retaining the chassis with finger to release the lock, and pull the chassis to your side.



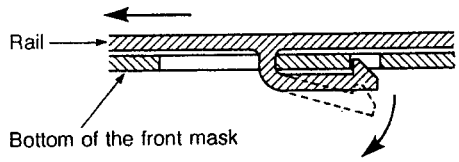
2. Remove the connector of the DG (degausser) coil from the main p.c. board.

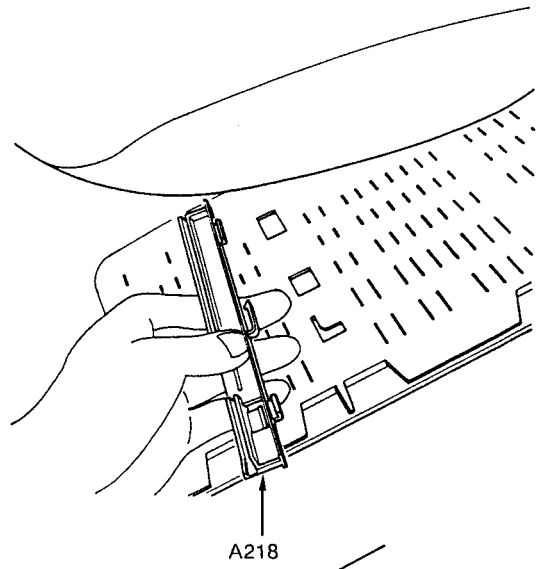


3. Peel the holding tape off the speaker leads, and remove the speaker from the front cover.

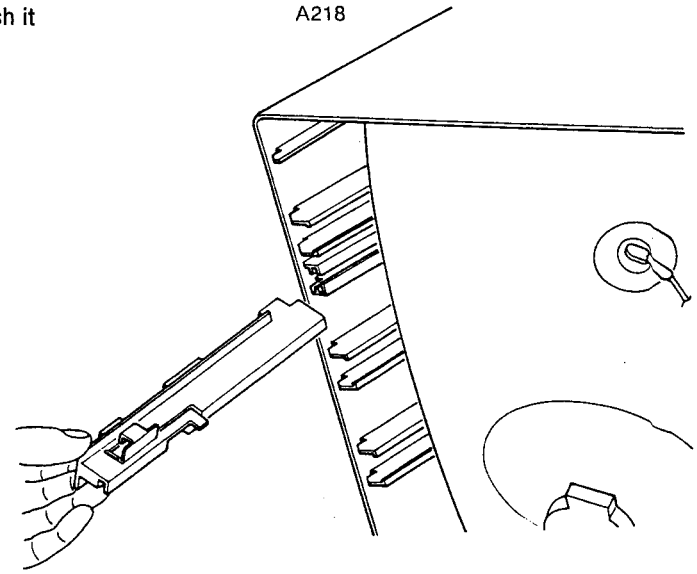


4. Remove the detachable rail A218 (left side).
   (Since a hook is provided at the center of the rail, access the hook from the back side of the bottom of the front mask and bend it to release the lock, and then, pull the rail to your side to remove.

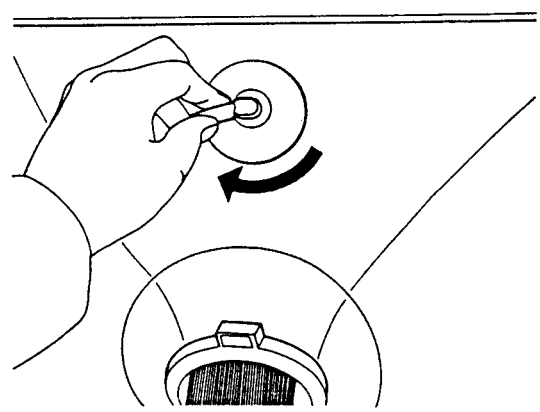




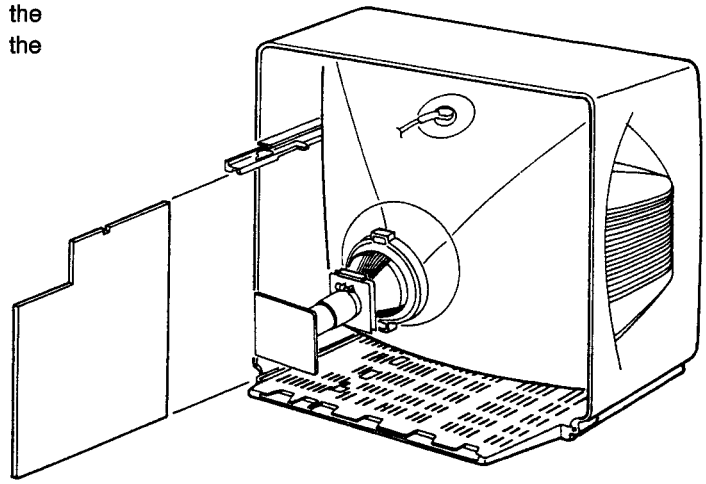
5. Insert the detachable rail A218 into the service slot for the rail at the left side of the front cover. (Push it until it touches the stopper.)

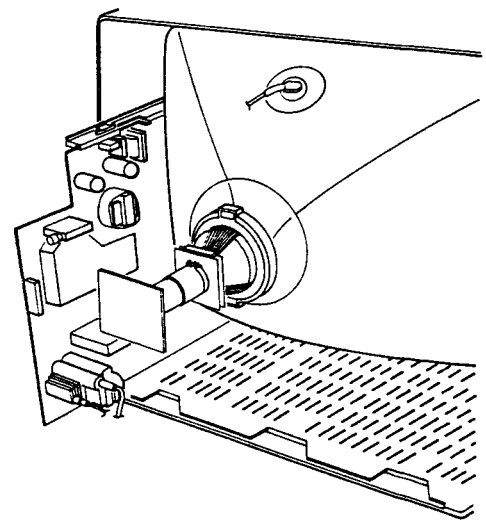


6. Twist the anode cap clockwise.
   (Pay enough care not to disconnect it.)



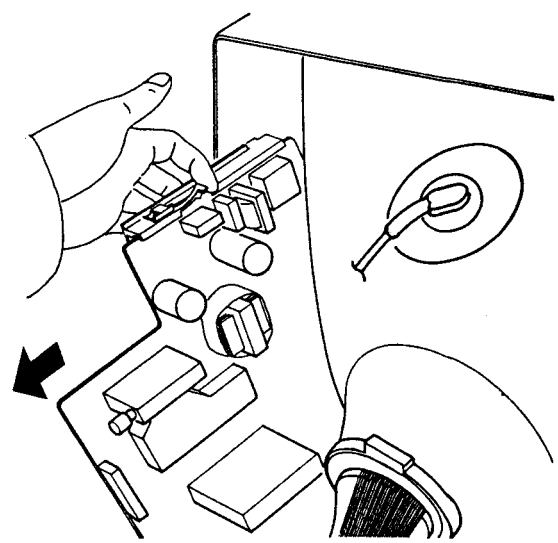
7. Insert and retain the main p.c. board between the above-mentioned detachable rail and the rib at the bottom left.
(Insert it until the hook engages to lock.)



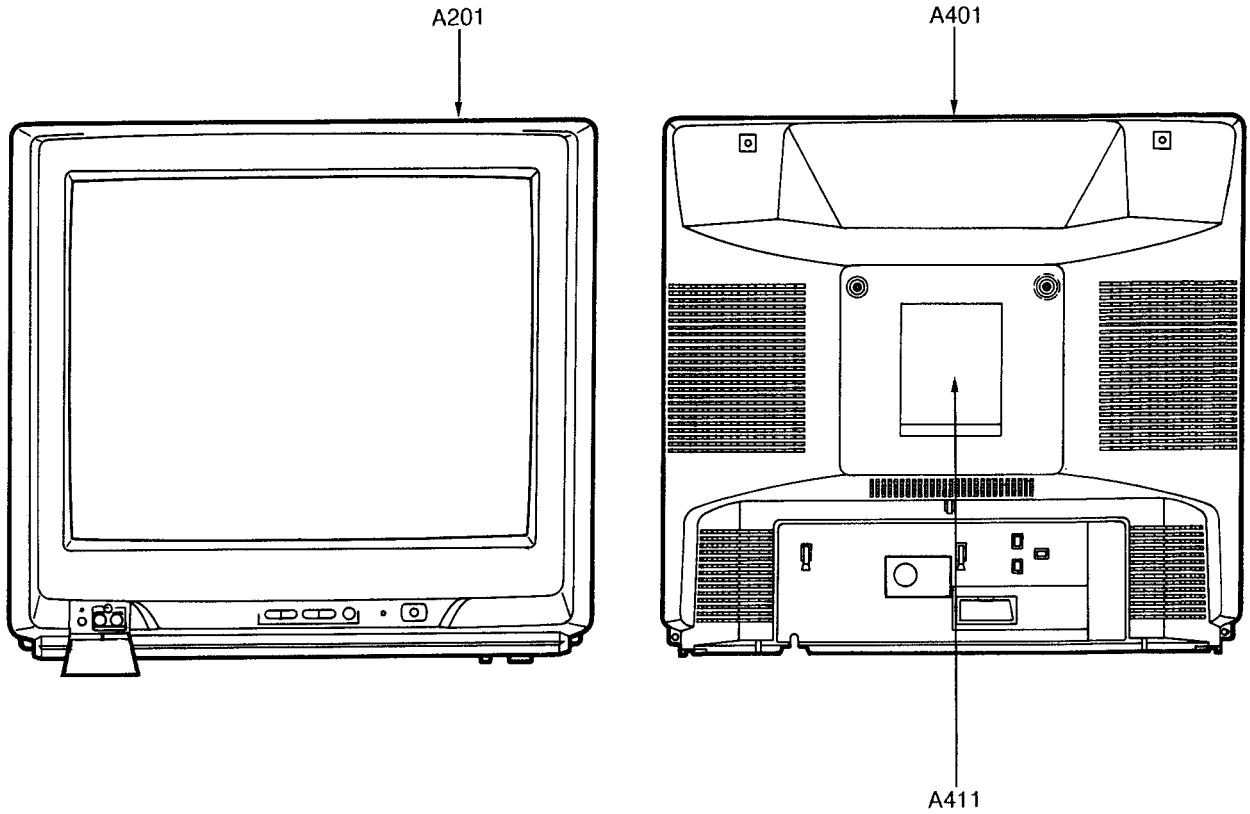


Retaining condition for servicing

8. After completion of the repair works, lift up the hook, release the lock and reverse the above procedure to restore it.



CABINET REPLACEMENT PARTS LIST



Location No.	Part No.	Description
A201	23410243	Front Cover
A218	23421601	Rail, Left (See page 10)
⚠A401	23425816	Back Cover
A411	23569007	Label, Model No.

CHASSIS REPLACEMENT PARTS LIST

WARNING: BEFORE SERVICING THIS CHASSIS, READ THE "X-RAY RADIATION PRECAUTION", "SAFETY PRECAUTION" AND "PRODUCT SAFETY NOTICE" ON PAGE 2 OF THIS MANUAL.

CAUTION: The international hazard symbols " ⚠ " in the schematic diagram and the parts list designate components which have special characteristics important for safety and should be replaced only with types identical to those in the original circuit or specified in the parts list. The mounting position of replacements is to be identical with originals. Before replacing any of these components, read carefully the PRODUCT SAFETY NOTICE on page 2. Do not degrade the safety of the receiver through improper servicing.

NOTICE:
- *The part number must be used when ordering parts, in order to assist in processing, be sure to include the Model number and Description.*
- *The PC board assembly with * mark is no longer available after the end of the production.*

ABBREVIATIONS:

Capacitors.....	CD	: Ceramic Disk	PF	: Plastic Film	EL	: Electrolytic
Resistors.....	CF	: Carbon Film	CC	: Carbon Composition	MF	: Metal Film
	OMF	: Oxide Metal Film	VR	: Variable Resistor	FR	: Fusible Resistor

(All CD and PF capacitors are ±5%, 50V and all resistors, ±5%, 1/6W unless otherwise noted.)

Location No.	Part No.	Description
CAPACITORS		
C101	24232103	CD, 0.01μF, +80%, -20%
C102	24232103	CD, 0.01μF, +80%, -20%
C103	24232103	CD, 0.01μF, +80%, -20%
C104	24232103	CD, 0.01μF, +80%, -20%
C105	24232103	CD, 0.01μF, +80%, -20%
C106	24232103	CD, 0.01μF, +80%, -20%
C107	24794102	EL, 1000μF, ±20%, 16V
C131	24538474	PF, 0.47μF
C132	24474102	CD, 1000pF, ±10%
C133	24474101	CD, 100pF, ±10%
C134	24590104	PF, 0.1μF
C135	24794470	EL, 47μF, ±20%, 16V
C136	24232103	CD, 0.01μF, +80%, -20%
C138	24206229	EL, 2.2μF, 50V
C141	24232103	CD, 0.01μF, +80%, -20%
C142	24794100	EL, 10μF, ±20%, 16V
C143	24232103	CD, 0.01μF, +80%, -20%
C144	24206229	EL, 2.2μF, 50V
C145	24353120	CD, 12pF
C161	24793101	EL, 100μF, ±20%, 10V
C162	24473560	CD, 56pF
C163	24473560	CD, 56pF
C168	24232103	CD, 0.01μF, +80%, -20%
C190	24232103	CD, 0.01μF, +80%, -20%
C193	24797229	EL, 2.2μF, ±20%, 50V
C195	24232103	CD, 0.01μF, +80%, -20%
C196	24590104	PF, 0.1μF
C197	24590104	PF, 0.1μF
C198	24590104	PF, 0.1μF
C199	24232103	CD, 0.01μF, +80%, -20%
C201	24590473	PF, 0.047μF
C202	24590473	PF, 0.047μF
C203	24794100	EL, 10μF, ±20%, 16V
C205	24794220	EL, 22μF, ±20%, 16V
C240	24538474	PF, 0.47μF
C302	24474101	CD, 100pF, ±10%
C303	24590104	PF, 0.1μF
C304	24212472	CD, 4700pF, ±10%
C306	24212391	CD, 390pF, ±10%
C312	24590823	PF, 0.082μF

Location No.	Part No.	Description
C313	24668101	EL, 100μF, ±20%, 35V
C314	24214102	CD, 1000pF, ±10%, 500V
C315	24214221	CD, 220pF, ±10%, 500V
C317	24617915	EL, 1μF, ±10%, 50V
C318	24630798	EL, 3300μF, ±10%, 25kV
C323	24082049	PF, 0.047μF, 100V
C325	24668221	EL, 220μF, ±20%, 35V
C331	24668102	EL, 1000μF, ±20%, 35V
C332	24082057	PF, 0.22μF, 100V
C341	24666101	EL, 100μF, ±20%, 16V
C403	24206010	EL, 1μF, 50V
C406	24590472	PF, 4700pF
C407	24590472	PF, 4700pF
C408	24666331	EL, 330μF, ±20%, 16V
C409	24232103	CD, 0.01μF, +80%, -20%
C410	24082261	PF, 5600pF, 100V
C411	24212101	CD, 100pF, ±10%
C412	24214332	CD, 3300pF, ±10%, 500V
C413	24590223	PF, 0.022μF
C416	24214271	CD, 270pF, ±10%, 500V
⚠C440	24082343	PF, 5600pF, ±3%, 1500V
C441	24214221	CD, 220pF, ±10%, 500V
C442	24095754	PF, 0.43μF, 200V
C443	24214221	CD, 220pF, ±10%, 500V
⚠C444	24082336	PF, 3600pF, ±3%, 1500V
C445	24095903	PF, 0.056μF, ±10%, 250V
C446	24666471	EL, 470μF, ±20%, 16V
C447	24679479	EL, 4.7μF, ±20%, 250V
C448	24640908	EL, 33μF, ±20%, 160V
C449	24667102	EL, 1000μF, ±20%, 25V
⚠C463	24212222	CD, 2200pF, ±10%
C470	24666220	EL, 22μF, ±20%, 16V
C471	24538474	PF, 0.47μF
C480	24538474	PF, 0.47μF
C481	24666101	EL, 100μF, ±20%, 16V
C482	24666101	EL, 100μF, ±20%, 16V
C501	24590104	PF, 0.1μF
C502	24232103	CD, 0.01μF, +80%, -20%
C503	24794221	EL, 220μF, ±20%, 16V
C504	24797478	EL, 0.47μF, ±20%, 50V
C505	24794100	EL, 10μF, ±20%, 16V

Location No.	Part No.	Description
C506	24473680	CD, 68pF
C507	24473680	CD, 68pF
C508	24473680	CD, 68pF
C509	24797100	EL, 10μF, ±20%, 50V
C511	24590104	PF, 0.1μF
C512	24590104	PF, 0.1μF
C513	24590104	PF, 0.1μF
C514	24590472	PF, 4700pF
C516	24212561	CD, 560pF, ±10%
C517	24794470	EL, 47μF, ±20%, 16V
C518	24590473	PF, 0.047μF
C520	24590102	PF, 1000pF
C521	24590102	PF, 1000pF
C531	24212391	CD, 390pF, ±10%
C532	24212391	CD, 390pF, ±10%
C533	24212391	CD, 390pF, ±10%
C534	24794471	EL, 470μF, ±20%, 16V
C536	24797479	EL, 4.7μF, ±20%, 50V
C601	24795471	EL, 470μF, ±20%, 25V
C602	24590104	PF, 0.1μF
C603	24795221	EL, 220μF, ±20%, 25V
C604	24474221	CD, 220pF, ±10%
C605	24206010	EL, 1μF, 50V
C606	24795220	EL, 22μF, ±20%, 25V
C607	24590682	PF, 6800pF
C608	24797010	EL, 1μF, ±20%, 50V
C609	24794470	EL, 47μF, ±20%, 16V
C610	24206010	EL, 1μF, 50V
C611	24212271	CD, 270pF, ±10%
C612	24212102	CD, 1000pF, ±10%
C613	24206010	EL, 1μF, 50V
C616	24797100	EL, 10μF, ±20%, 50V
C617	24206010	EL, 1μF, 50V
C618	24797470	EL, 47μF, ±20%, 50V
C619	24590332	PF, 3300pF
C620	24797229	EL, 2.2μF, ±20%, 50V
C622	24797010	EL, 1μF, ±20%, 50V
C623	24232103	CD, 0.01μF, +80%, −20%
C624	24232103	CD, 0.01μF, +80%, −20%
⚠ C801	24082363	PF, 0.22μF, ±20%, AC250V
⚠ C802	24094655	CD, 1000pF, ±20%, AC400V
⚠ C803	24094655	CD, 1000pF, ±20%, AC400V
C807	24092281	CD, 4700pF, ±20%, AC250V
C808	24092281	CD, 4700pF, ±20%, AC250V
C809	24086871	EL, 120μF, ±20%, 400V
C812	24092341	CD, 470pF, ±10%, 2kV
C813	24095931	PF, 2200pF, 1250V
C814	24590223	PF, 0.022μF
C815	24590182	PF, 1800pF
C816	24666470	EL, 47μF, ±20%, 16V
C817	24676220	EL, 22μF, ±20%, 100V
C820	24794470	EL, 47μF, ±20%, 16V
C828	24212101	CD, 100pF, ±10%
C829	24795471	EL, 470μF, ±20%, 25V
C830	24092337	CD, 220pF, ±10%, 2kV
C831	24086953	EL, 220μF, ±20%, 160V
C835	24797479	EL, 4.7μF, ±20%, 50V
C836	24797100	EL, 10μF, ±20%, 50V
C837	24797100	EL, 10μF, ±20%, 50V
C838	24538474	PF, 0.47μF
C844	24094656	CD, 2200pF, ±20%, AC400V
C849	24214471	CD, 470pF, ±10%, 500V
C901	24700100	EL, 10μF, ±20%, 250V
C902	24095931	PF, 2200pF, 1250V

Location No.	Part No.	Description
C903	24212102	CD, 1000pF, ±10%
CA01	24474101	CD, 100pF, ±10%
CA14	24232103	CD, 0.01μF, +80%, −20%
CA15	24794100	EL, 10μF, ±20%, 16V
CA16	24232103	CD, 0.01μF, +80%, −20%
CA18	24232103	CD, 0.01μF, +80%, −20%
CA19	24794470	EL, 47μF, ±20%, 16V
CA20	24474101	CD, 100pF, ±10%
CA21	24435470	CD, 47pF, 500V
CA22	24590104	PF, 0.1μF
CA23	24590104	PF, 0.1μF
CA24	24590104	PF, 0.1μF
CA37	24590104	PF, 0.1μF
CA39	24474391	CD, 390pF, ±10%
CA40	24212221	CD, 220pF, ±10%
CA42	24590104	PF, 0.1μF
CA43	24590104	PF, 0.1μF
CA44	24794470	EL, 47μF, ±20%, 16V
CA45	24473560	CD, 56pF
CA46	24473560	CD, 56pF
CA47	24212103	CD, 0.01μF, ±10%
CA48	24232103	CD, 0.01μF, +80%, −20%
CA49	24475222	CD, 2200pF, 16V
CA50	24797479	EL, 4.7μF, ±20%, 50V
CA51	24474101	CD, 100pF, ±10%
CN02	24794100	EL, 10μF, ±20%, 16V
CN03	24794100	EL, 10μF, ±20%, 16V
CV01	24794101	EL, 100μF, ±20%, 16V
CV02	24793471	EL, 470μF, ±20%, 10V
CV03	24232103	CD, 0.01μF, +80%, −20%
CX08	24590104	PF, 0.1μF
CX09	24590104	PF, 0.1μF
CX10	24590104	PF, 0.1μF

RESISTORS

R101	24366101	CF, 100 ohm
R102	24366103	CF, 10k ohm
R103	24366103	CF, 10k ohm
R104	24366392	CF, 3900 ohm
R105	24366103	CF, 10k ohm
R135	24366682	CF, 6800 ohm
R136	24366122	CF, 1200 ohm
R137	24366681	CF, 680 ohm
R138	24366360	CF, 36 ohm
R140	24366104	CF, 100k ohm
R141	24366122	CF, 1200 ohm
R142	24366472	CF, 4700 ohm
R143	24366122	CF, 1200 ohm
R145	24366183	CF, 18k ohm
R151	24066926	VR, 10k ohm, 1/10W
R161	24366183	CF, 18k ohm
R162	24366681	CF, 680 ohm
R163	24366682	CF, 6800 ohm
R173	24366271	CF, 270 ohm
R174	24366392	CF, 3900 ohm
R178	24366102	CF, 1k ohm
R179	24366391	CF, 390 ohm
R180	24366331	CF, 330 ohm
R181	24366221	CF, 220 ohm
R182	24366820	CF, 82 ohm
R185	24366101	CF, 100 ohm
R186	24366391	CF, 390 ohm
R187	24366223	CF, 22k ohm
R188	24366223	CF, 22k ohm

Location No.	Part No.	Description
R189	24366102	CF, 1k ohm
R191	24942226	CC, 22M ohm, 1/2W
R201	24366511	CF, 510 ohm
R203	24366473	CF, 47k ohm
R205	24366274	CF, 270k ohm
R206	24366103	CF, 10k ohm
R207	24366103	CF, 10k ohm
R211	24366153	CF, 15k ohm
R212	24366183	CF, 18k ohm
R213	24366911	CF, 910 ohm
R215	24366621	CF, 620 ohm
R217	24366103	CF, 10k ohm
R240	24366183	CF, 18k ohm
R241	24366123	CF, 12k ohm
R252	24066597	VR, 1k ohm, 1/10W
R253	24066597	VR, 1k ohm, 1/10W
R299	24366683	CF, 68k ohm
R301	24366155	CF, 1.5M ohm
R302	24366564	CF, 560k ohm
R304	24366102	CF, 1k ohm
R311	24366101	CF, 100 ohm
R316	24366102	CF, 1k ohm
R317	24366563	CF, 56k ohm
R318	24366393	CF, 39k ohm
R319	24552272	OMF, 2700 ohm, 1/2W
R320	24383271	OMF, 270 ohm, 2W
R321	24366133	CF, 13k ohm
R322	24366104	CF, 100k ohm
R323	24322828	OMF, 0.82 ohm, 1W
R325	24366113	CF, 11k ohm
R326	24382470	OMF, 47 ohm, 1W
⚠R327	24339569	MF, 5.6 ohm, 2W
R330	24321109	MF, 1 ohm, 1/2W
R333	24366222	CF, 2200 ohm
R340	24366473	CF, 47k ohm
R341	24366182	CF, 1800 ohm
R342	24366562	CF, 5600 ohm
R343	24310159	MF, 1.5 ohm, 1/2W
R344	24366392	CF, 3900 ohm
R351	24066606	VR, 1M ohm, 1/10W
R401	24366182	CF, 1800 ohm
R403	24366153	CF, 15k ohm
R407	24366222	CF, 2200 ohm
R409	24366564	CF, 560k ohm
R410	24552472	OMF, 4700 ohm, 1/2W
R411	24366561	CF, 560 ohm
R412	24366103	CF, 10k ohm
R413	24366331	CF, 330 ohm
R416	24510152	Cement, 1500 ohm, 5W
R419	24366560	CF, 56 ohm
R422	24366273	CF, 27k ohm
R440	24366103	CF, 10k ohm
R441	24366103	CF, 10k ohm
R442	24009951	OMF, 1k ohm, 1W
⚠R444	24338398	MF, 0.39 ohm, 1W
⚠R448	24338338	MF, 0.33 ohm, 1W
R451	24066600	VR, 10k ohm, 1/10W
R470	24338568	MF, 0.56 ohm, 1W
R471	24552101	OMF, 100 ohm, 1/2W
R472	24376393	CF, 39k ohm, 1/2W
R474	24366331	CF, 330 ohm
R475	24366102	CF, 1k ohm
R477	24366153	CF, 15k ohm
R480	24546229	FR, 2.2 ohm, 1/2W

Location No.	Part No.	Description
R501	24366332	CF, 3300 ohm
R502	24366472	CF, 4700 ohm
R503	24366221	CF, 220 ohm
R504	24366221	CF, 220 ohm
R505	24366221	CF, 220 ohm
R506	24366183	CF, 18k ohm
R509	24366433	CF, 43k ohm
R512	24366104	CF, 100k ohm
R513	24366473	CF, 47k ohm
R514	24552221	OMF, 220 ohm, 1/2W
R517	24366103	CF, 10k ohm
R521	24366102	CF, 1k ohm
R523	24366102	CF, 1k ohm
R525	24366102	CF, 1k ohm
R528	24366511	CF, 510 ohm
R529	24366182	CF, 1800 ohm
R530	24366472	CF, 4700 ohm
R531	24366472	CF, 4700 ohm
R532	24366561	CF, 560 ohm
R533	24366471	CF, 470 ohm
R534	24366471	CF, 470 ohm
R535	24366471	CF, 470 ohm
R536	24366122	CF, 1200 ohm
R537	24366122	CF, 1200 ohm
R538	24366122	CF, 1200 ohm
R540	24366273	CF, 27k ohm
R541	24366273	CF, 27k ohm
R543	24366273	CF, 27k ohm
R547	24552820	OMF, 82 ohm, 1/2W
R548	24366101	CF, 100 ohm
R551	24066600	VR, 10k ohm, 1/10W
R557	24066600	VR, 10k ohm, 1/10W
R558	24066600	VR, 10k ohm, 1/10W
R559	24066600	VR, 10k ohm, 1/10W
R561	24366390	CF, 39 ohm
R562	24366390	CF, 39 ohm
R563	24366390	CF, 39 ohm
R564	24366361	CF, 360 ohm
R565	24366361	CF, 360 ohm
R574	24366153	CF, 15k ohm
R575	24366103	CF, 10k ohm
R580	24366103	CF, 10k ohm
R581	24366102	CF, 1k ohm
R591	24382183	OMF, 18k ohm, 1W
R592	24382183	OMF, 18k ohm, 1W
R593	24382183	OMF, 18k ohm, 1W
R601	24366339	CF, 3.3 ohm
R602	24366123	CF, 12k ohm
R603	24366182	CF, 1800 ohm
R604	24366103	CF, 10k ohm
R605	24552331	OMF, 330 ohm, 1/2W
R607	24366103	CF, 10k ohm
R614	24366562	CF, 5600 ohm
R615	24366562	CF, 5600 ohm
R616	24366562	CF, 5600 ohm
R618	24366273	CF, 27k ohm
R621	24366222	CF, 2200 ohm
R622	24366682	CF, 6800 ohm
R623	24366682	CF, 6800 ohm
R624	24366681	CF, 680 ohm
R625	24366104	CF, 100k ohm
R626	24366103	CF, 10k ohm
R627	24366153	CF, 15k ohm
R628	24366104	CF, 100k ohm

Location No.	Part No.	Description
R629	24366153	CF, 15k ohm
R630	24366392	CF, 3900 ohm
R633	24366153	CF, 15k ohm
R638	24366102	CF, 1k ohm
R639	24366683	CF, 68k ohm
R641	24366103	CF, 10k ohm
R642	24366153	CF, 15k ohm
R644	24366332	CF, 3300 ohm
R645	24366204	CF, 200k ohm
⚠ R801	24009954	Metal-Glazed Resistor, 2.2M ohm, 1/2W
R803	24366155	CF, 1.5M ohm
R804	24366561	CF, 560 ohm
R805	24377394	CF, 390k ohm, 1W
R806	24383470	OMF, 47 ohm, 2W
R807	24383330	OMF, 33 ohm, 2W
R808	24531100	FR, 10 ohm, 1/2W
R809	24366561	CF, 560 ohm
R810	24366561	CF, 560 ohm
R811	24322278	MF, 0.27 ohm, 1W
R812	24366470	CF, 47 ohm
R813	24366561	CF, 560 ohm
R814	24366102	CF, 1k ohm
R815	24366561	CF, 560 ohm
R816	24366103	CF, 10k ohm
R817	24366102	CF, 1k ohm
R818	24366102	CF, 1k ohm
R819	24321569	MF, 5.6 ohm, 1/2W
R820	24366561	CF, 560 ohm
R825	24366472	CF, 4700 ohm
R828	24366339	CF, 3.3 ohm
R830	24310159	MF, 1.5 ohm, 1/2W
R842	24366681	CF, 680 ohm
R843	24366821	CF, 820 ohm
⚠ R844	24005007	Metal-Glazed Resistor, 8.2M ohm, 1W
R848	24366392	CF, 3900 ohm
R860	24366561	CF, 560 ohm
R864	24382560	OMF, 56 ohm, 1W
R865	24366681	CF, 680 ohm
R866	24366471	CF, 470 ohm
R867	24366103	CF, 10k ohm
R868	24366472	CF, 4700 ohm
R870	24383103	OMF, 10k ohm, 2W
R871	24366472	CF, 4700 ohm
R872	24510479	Cement, 4.7 ohm, 5W
R878	24531270	FR, 27 ohm, 1/2W
R879	24366472	CF, 4700 ohm
R884	24531120	FR, 12 ohm, 1/2W
⚠ R890	24019340	PTC Thermistor, 18 ohm, 290V
R893	24366103	CF, 10k ohm
R901	24552272	OMF, 2700 ohm, 1/2W
R902	24552272	OMF, 2700 ohm, 1/2W
R903	24552272	OMF, 2700 ohm, 1/2W
⚠ R920	24000940	FR, 2 ohm, 2W
RA01	24366103	CF, 10k ohm
RA02	24366103	CF, 10k ohm
RA03	24366103	CF, 10k ohm
RA05	24366103	CF, 10k ohm
RA06	24366103	CF, 10k ohm
RA07	24366472	CF, 4700 ohm
RA09	24019001	MF, 100k ohm, ±1%, 1/4W
RA17	24366471	CF, 470 ohm

Location No.	Part No.	Description
RA21	24366683	CF, 68k ohm
RA24	24366225	CF, 2.2M ohm
RA25	24366333	CF, 33k ohm
RA27	24366333	CF, 33k ohm
RA28	24000372	MF, 3900 ohm, ±1%, 1/4W
RA33	24366221	CF, 220 ohm
RA34	24000635	MF, 12k ohm, ±1%, 1/4W
RA35	24366223	CF, 22k ohm
RA36	24366102	CF, 1k ohm
RA37	24366273	CF, 27k ohm
RA40	24366102	CF, 1k ohm
RA41	24366103	CF, 10k ohm
RA42	24366103	CF, 10k ohm
RA45	24366103	CF, 10k ohm
RA49	24366103	CF, 10k ohm
RA54	24366472	CF, 4700 ohm
RA55	24366471	CF, 470 ohm
RA57	24366103	CF, 10k ohm
RA58	24366222	CF, 2200 ohm
RA60	24366331	CF, 330 ohm
RA61	24366103	CF, 10k ohm
RA64	24366103	CF, 10k ohm
RA65	24366103	CF, 10k ohm
RA66	24366104	CF, 100k ohm
RA70	24366332	CF, 3300 ohm
RA71	24366682	CF, 6800 ohm
RA72	24366203	CF, 20k ohm
RA76	24366103	CF, 10k ohm
RA78	24366102	CF, 1k ohm
RA81	24366471	CF, 470 ohm
RA86	24366103	CF, 10k ohm
RA88	24366103	CF, 10k ohm
RA90	24366103	CF, 10k ohm
RA91	24366102	CF, 1k ohm
RA92	24366473	CF, 47k ohm
RA96	24366123	CF, 12k ohm
RA97	24366152	CF, 1500 ohm
RA98	24366154	CF, 150k ohm
RA99	24366564	CF, 560k ohm
RE01	24366391	CF, 390 ohm
RN01	24366101	CF, 100 ohm
RN05	24366564	CF, 560k ohm
RN07	24366223	CF, 22k ohm
RV01	24366151	CF, 150 ohm
RV02	24382101	OMF, 100 ohm, 1W
RV03	24552101	OMF, 100 ohm, 1/2W
RV04	24366680	CF, 68 ohm
RV05	24366103	CF, 10k ohm
RV06	24366102	CF, 1k ohm
RV08	24366560	CF, 56 ohm
RV09	24366102	CF, 1k ohm
RV10	24366750	CF, 75 ohm
RV11	24366102	CF, 1k ohm
RV12	24366750	CF, 75 ohm
RV13	24366102	CF, 1k ohm
RV14	24366750	CF, 75 ohm
RV15	24366750	CF, 75 ohm
RV16	24366682	CF, 6800 ohm
RV17	24366102	CF, 1k ohm
RV19	24366183	CF, 18k ohm
RV22	24366182	CF, 1800 ohm
RV23	24366102	CF, 1k ohm
RV24	24366621	CF, 620 ohm
RV25	24366621	CF, 620 ohm

Location No.	Part No.	Description
RV26	24366101	CF, 100 ohm
RV27	24366101	CF, 100 ohm
RV28	24366101	CF, 100 ohm
RV29	24366681	CF, 680 ohm
RV30	24366681	CF, 680 ohm
RX08	24366391	CF, 390 ohm
RX09	24366391	CF, 390 ohm
RX10	24366391	CF, 390 ohm
COILS & TRANSFORMERS		
L101	23238559	Coil, Peaking, TRF4R56AJ
L102	23221803	Coil, Choke, TLN3040D
L105	23261986	Coil, RF Choke, TRF9220
L107	23238713	Coil, Peaking, TRF4120AJ
L108	23238714	Coil, Peaking, TRF4100AJ
L311	23103859	Coil (Ferrite Bead), TEM2011
L408	23221722	Coil, Choke, TLN3142D
L410	23289100	Coil, Peaking, TRF4100AF
L441	23233070	Coil, Linearity, TLN2111G
⚠L462	----------	DY, Supplied with V901
L590	23289100	Coil, Peaking, TRF4100AF
L811	23103859	Coil (Ferrite Bead), TEM2011
L821	23222694	Coil, Width, TLN2026
L823	23103859	Coil (Ferrite Bead), TEM2011
L826	23222694	Coil, Width, TLN2026
L829	23103859	Coil (Ferrite Bead), TEM2011
L866	23289229	Coil, Peaking, TRF42R2AF
⚠L901	23200205	Coil, Degaussing, TSB-2333AR
LA02	23289109	Coil, Peaking, TRF41R0AF
LA03	23103859	Coil (Ferrite Bead), TEM2011
LA04	23103859	Coil (Ferrite Bead), TEM2011
LA05	23103859	Coil (Ferrite Bead), TEM2011
LV01	23238714	Coil, Peaking, TRF4100AJ
T103	23262813	Coil, IF, TRF1077D
⚠T401	23224983	Transformer, Horiz. Drive, TLN1039
⚠T461	23236464	Transformer, Flyback, TFB4123AR
⚠T801	23211644	Line Filter, TRF3118G
⚠T803	23217240	Transformer, Converter, TPW3301AR
SEMICONDUCTORS		
Q101	23119441	IC, LA7910
Q105	A6708871	Transistor, 2SC388ATM
Q106	23114528	Transistor, 2SC1740S-Q
Q110	23114528	Transistor, 2SC1740S-Q
Q111	23114528	Transistor, 2SC1740S-Q
Q112	23114530	Transistor, 2SA933S-Q
Q301	B0377890	IC, TA8403K
Q340	23114530	Transistor, 2SA933S-Q
Q402	A6330069	Transistor, 2SC2482 FA-1
⚠Q404	23314375	Transistor, ON4409(508D)
Q470	A6547250	Transistor, 2SA1320
Q480	23904844	IC, MCT7809BT
Q501	23904605	IC, TDA8361
Q502	23904607	IC, TDA4662
Q504	23114530	Transistor, 2SA933S-Q
Q505	A6330069	Transistor, 2SC2482 FA-1
Q506	23114530	Transistor, 2SA933S-Q
Q507	A6330069	Transistor, 2SC2482 FA-1
Q508	23114530	Transistor, 2SA933S-Q
Q509	A6330069	Transistor, 2SC2482 FA-1
Q510	A6330069	Transistor, 2SC2482 FA-1

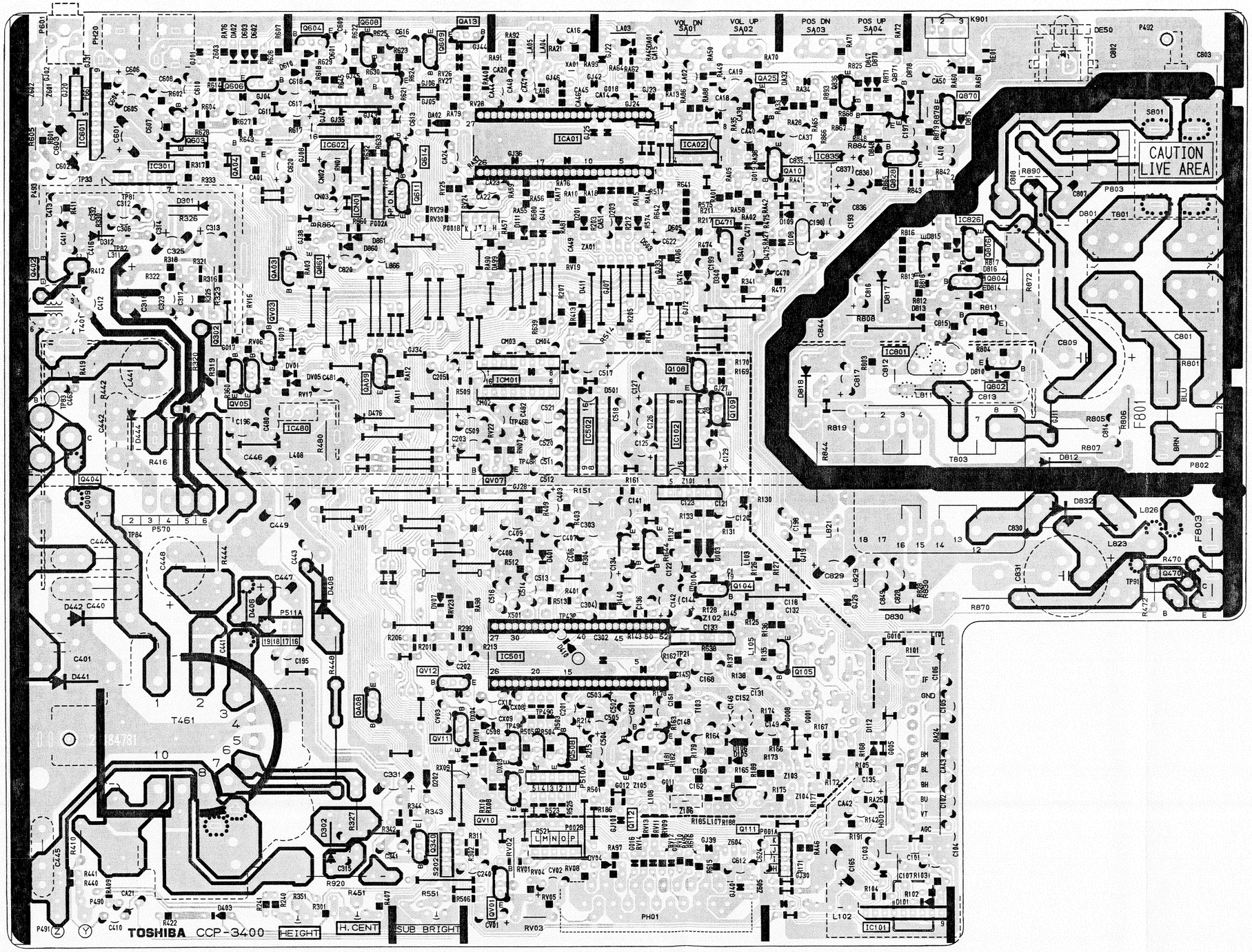
Location No.	Part No.	Description
Q511	23114530	Transistor, 2SA933S-Q
Q601	23119668	IC, TDA2611A
Q602	23318916	IC, MC14053BCP
Q603	A6342206	Transistor, 2SC2878-A(TE
Q604	23114530	Transistor, 2SA933S-Q
Q606	A6010040	Transistor, RN2004
Q607	23114528	Transistor, 2SC1740S-Q
Q608	23114528	Transistor, 2SC1740S-Q
Q609	A6342206	Transistor, 2SC2878-A(TE
Q613	23114528	Transistor, 2SC1740S-Q
Q801	23314146	IC(STR), STR58041
Q802	A6534145	Transistor, 2SA1020-Y(C)
Q803	A6333346	Transistor, 2SC2655-Y(C)
Q804	23114528	Transistor, 2SC1740S-Q
Q805	23114528	Transistor, 2SC1740S-Q
Q806	23114528	Transistor, 2SC1740S-Q
⚠Q826	A8645166	Photo Coupler, TLP721F(D4-G
Q828	23114528	Transistor, 2SC1740S-Q
Q831	23114528	Transistor, 2SC1740S-Q
⚠Q835	23318299	IC, L78MR05
Q836	23114530	Transistor, 2SA933S-Q
Q861	A6333346	Transistor, 2SC2655-Y(C)
Q870	A6333346	Transistor, 2SC2655-Y(C)
Q871	23114528	Transistor, 2SC1740S-Q
QA01	23905376	IC, SAA5290ZP1032
QA02	23904706	IC, NM24C02EN
QA03	23114528	Transistor, 2SC1740S-Q
QA04	23114528	Transistor, 2SC1740S-Q
QA08	23114528	Transistor, 2SC1740S-Q
QA10	23114528	Transistor, 2SC1740S-Q
QA25	23114528	Transistor, 2SC1740S-Q
QN01	23319504	IC, MM1031XS
QV01	23114528	Transistor, 2SC1740S-Q
QV03	23114530	Transistor, 2SA933S-Q
QV05	23114528	Transistor, 2SC1740S-Q
QV07	A6002030	Transistor, RN1203
QV10	23114528	Transistor, 2SC1740S-Q
QV11	23114528	Transistor, 2SC1740S-Q
QV12	23114528	Transistor, 2SC1740S-Q
D101	23115599	Diode, 1N4148
D108	23115878	Diode, Zener, μPC574J, (L)
D109	23115599	Diode, 1N4148
D111	23115599	Diode, 1N4148
D201	23115599	Diode, 1N4148
D202	A7150041	Diode, 1SS104
D203	23115599	Diode, 1N4148
D301	23118479	Diode, BYD33J
D302	23118479	Diode, BYD33J
D312	23316794	Diode, SC570A
D340	23316658	Diode, Zener, MTZJ3.6A
D401	23316792	Diode, SC215
D403	23316688	Diode, Zener, MTZJ9.1C
D406	23118479	Diode, BYD33J
D408	23118052	Diode, RU4Z
D410	23316687	Diode, Zener, MTZJ9.1B
D411	23115599	Diode, 1N4148
D441	23118338	Diode, RU4AM
D442	23316254	Diode, ERC06-15
D444	23118479	Diode, BYD33J
D471	A7801205	SCR, SF0R3G42
D474	23316728	Diode, Zener, MTZJ16B
D475	23316719	Diode, Zener, MTZJ12B
D476	23118479	Diode, BYD33J
D501	23316669	Diode, Zener, MTZJ5.1B

Location No.	Part No.	Description
D503	23115599	Diode, 1N4148
D591	23316554	Diode, 1SS146
D592	23316554	Diode, 1SS146
D593	23316554	Diode, 1SS146
D594	23115599	Diode, 1N4148
D601	23115599	Diode, 1N4148
D602	23115599	Diode, 1N4148
D603	23115599	Diode, 1N4148
D605	23115599	Diode, 1N4148
D610	23115599	Diode, 1N4148
D801	23118124	Diode, LB-156 (LF-B)
D810	23316725	Diode, Zener, MTZJ15B
D811	23115599	Diode, 1N4148
D812	23118479	Diode, BYD33J
D813	23115599	Diode, 1N4148
D814	23316672	Diode, Zener, MTZJ5.6B
D815	23115599	Diode, 1N4148
D816	23316648	Diode, Zener, MTZJ2.2A
D817	23118479	Diode, BYD33J
D818	23118479	Diode, BYD33J
D819	23316675	Diode, Zener, MTZJ6.2B
D830	23118479	Diode, BYD33J
D832	23118451	Diode, RU-4A
D847	23115599	Diode, 1N4148
D848	23316666	Diode, Zener, MTZJ4.7B
D860	23316674	Diode, Zener, MTZJ6.2A
D861	23316669	Diode, Zener, MTZJ5.1B
D870	23115599	Diode, 1N4148
D875	23115599	Diode, 1N4148
D878	23316689	Diode, Zener, MTZJ10A
DA01	23316675	Diode, Zener, MTZJ6.2B
DA02	23115599	Diode, 1N4148
DA03	23115599	Diode, 1N4148
DA32	23115599	Diode, 1N4148
DA99	23115599	Diode, 1N4148
DE50	23358504	LED, Red, SCL003URC3FX
DV01	23115599	Diode, 1N4148
DV04	23115599	Diode, 1N4148
DV05	23316666	Diode, Zener, MTZJ4.7B
DV07	23316669	Diode, Zener, MTZJ5.1B
DX01	23115599	Diode, 1N4148
DX03	23115599	Diode, 1N4148
DX04	23115599	Diode, 1N4148
MISCELLANEOUS		
B202	23451651	Holder, FBT
⚠F801	23144473	Fuse, 5.0A
F801A	23165433	Holder, Fuse
⚠F803	23144875	Fuse, 0.63A
F803A	23165433	Holder, Fuse
G009	23103859	Coil (Ferrite Bead), TEM2011
G010	24366680	CF, 68 ohm
G012	24366390	CF, 39 ohm
P601	23365292	Jack, Earphone
⚠P801	23372014	Power Cord
PH01	23365598	Connector, 21Pin
PH20	23364692	Jack, Phono, 2P
S202	23344333	Switch, Lever, 1C3P
⚠S801	23145434	Switch, Power, 2C2P
SA01	23145430	Switch, Push, 1C1P
SA02	23145430	Switch, Push, 1C1P
SA03	23145430	Switch, Push, 1C1P
SA04	23145430	Switch, Push, 1C1P
⚠V901A	23902067	Socket, CRT, 10P

Location No.	Part No.	Description
W661	23351079	Speaker, SPK-1351, 77x77mm, 16 ohm
X501	23153360	Crystal, 4.43MHz
Z102	23303134	Filter, 38.9M, OFWG1962M
Z103	23107855	Ceramic Filter, 5.5MHz, TCF1031
Z105	23107927	Ceramic Video Trap, 5.5MHz, TCF1011
Z601	23107744	Filter, TEM1012
Z602	23107744	Filter, TEM1012
Z603	23107744	Filter, TEM1012
Z604	23107744	Filter, TEM1012
Z605	23107744	Filter, TEM1012
ZA01	24094645	Capacitor Block, 0.01μFx4, 50V
PC BOARD ASSEMBLIES		
* U902A	23704923	Main Board, PB5860D1
* U902B	23704924	CRT Drive Board, PB5860D2
PICTURE TUBE		
⚠V901	23312670	Picture Tube, A51EAL155X01
TUNER		
H001	23321209	Tuner, EGA13
ACCESSORIES		
K902	23306084	Remote Hand Unit, CT-9784
AT03	23305743	Battery Cover
Y101	23562564	Owner's Manual, English, 2150TN
Y102	23562565	Owner's Manual, Spanish, 2150TN
Y103	23562566	Owner's Manual, Danish, 2150TN
Y104	23562567	Owner's Manual, Swedish, 2150TN
Y105	23562568	Owner's Manual, Finnish, 2150TN
Y106	23562569	Owner's Manual, Norwegian, 2150TN

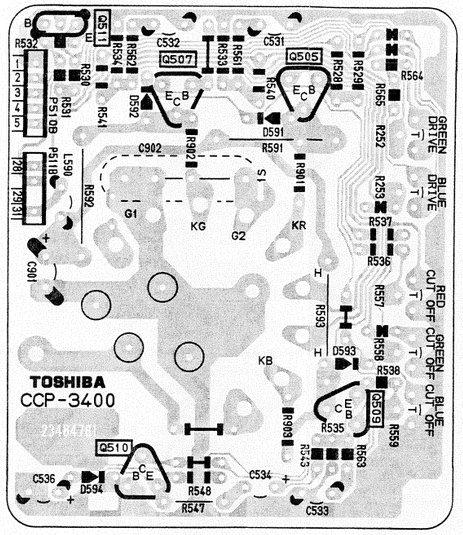
MAIN BOARD PB5860D1

BOTTOM (FOIL) SIDE



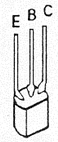
CRT DRIVE BOARD PB5860D2

BOTTOM (FOIL) SIDE

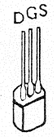


TERMINAL VIEW OF TRANSISTORS

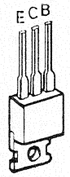
① BC327
BC337
BC547A
BC547B
BC547C
BC557A
BC557B
BC556A



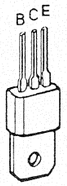
② 2SK30ATM
2SK117



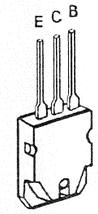
③ BD202



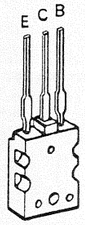
④ BF871
2SD553
2SC1569



⑤ 2SC3678
2SC3182N



⑥ 2SD1427
2SD1432



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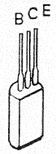
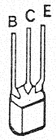
2SC2230
2SA1020
2SC2655
2SC752GTM



⑧ 2SC388ATM
2SA1015
2SC1959
2SA562TM



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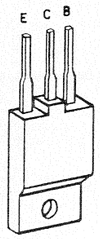
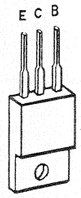
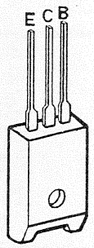


⑩ 2SC2023



⑪ ON4409



SCHEMATIC DIAGRAM MODEL: 2150TN

CAUTION: The international hazard symbols "⚠" in the schematic diagram and the parts list designate components which have special characteristics important for safety and should be replaced only with types identical to those in the original circuit or specified in the parts list. The mounting position of replacements is to be identical with originals. Before replacing any of these components, read carefully the PRODUCT SAFETY NOTICE on page 2. Do not degrade the safety of the receiver through improper servicing.

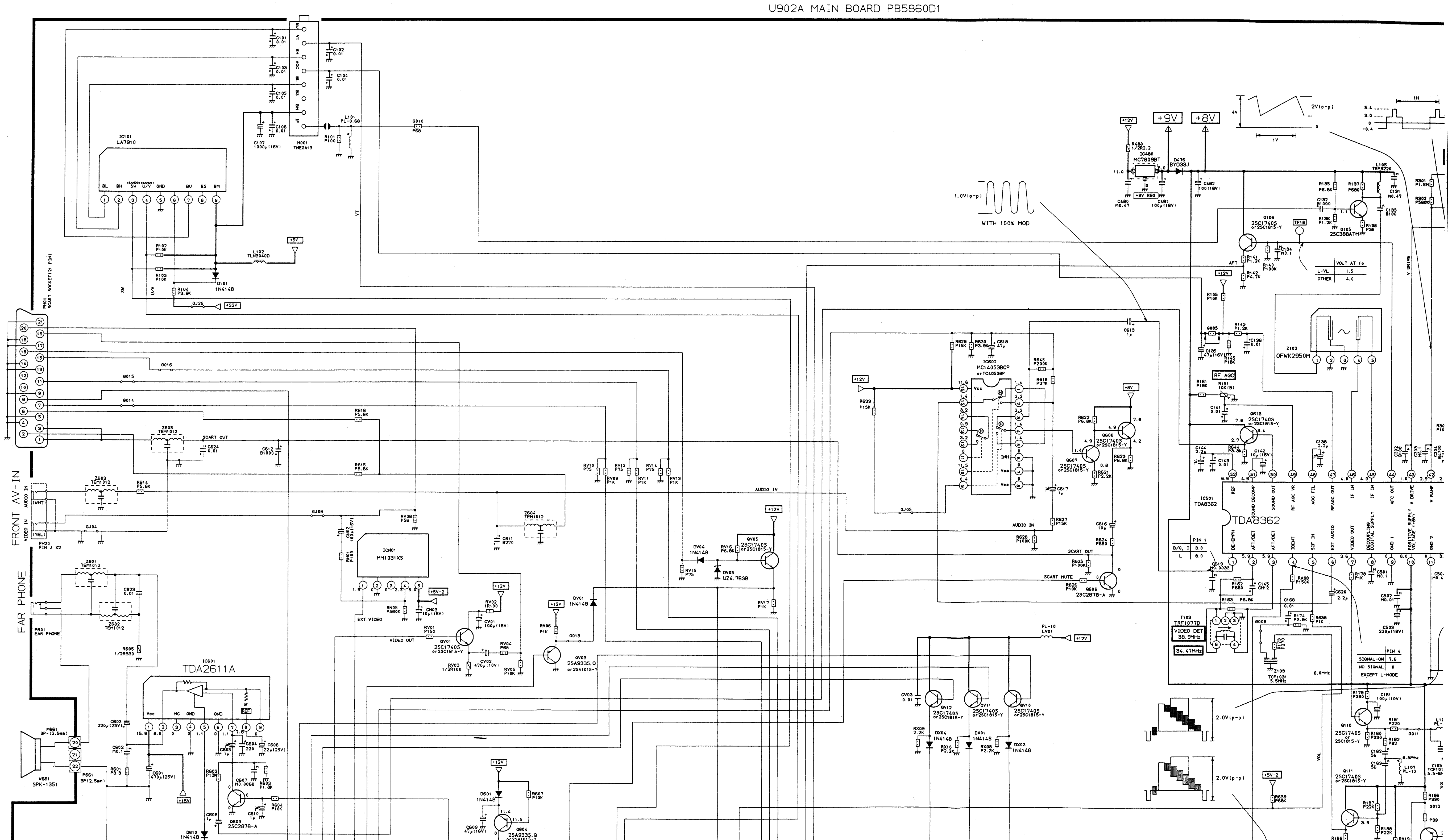
OBSERVATION OF VOLTAGES AND WAVEFORMS

1. Voltages read with VTVM from point shown to chassis ground, line voltage 220 volts, colour bar signal. Voltages reading may vary ±20%.
2. All waveforms are taken using a wide band oscilloscope and a low capacity probe.
3. Waveforms are taken using a standard colour bar signal.
4. Make sure that CONTRAST and COLOUR controls are in mid position and BRIGHTNESS control is almost in maximum position. Set other controls for best picture.

NOTES:

1. D.C. resistance valu gram. These are me
2. The circuits are subj
3. ⊖ : Solder links.

1	AUDIO OUT (R)
2	AUDIO IN (R)
3	AUDIO OUT (L)
4	AUDIO EARTH
5	EARTH
6	AUDIO IN (L)
7	BLUE IN
8	EXT/TV
9	GREEN EARTH
10	NC
11	GREEN IN
12	NC
13	RED EARTH
14	NC
15	RED IN
16	RAPID BLANKING
17	VIDEO EARTH
18	RAPID BLK EARTH
19	VIDEO OUT
20	VIDEO IN
21	SHIELD EARTH



EAR PHONE
PS01 EAR PHONE
ZS02 TEH1012
C623 0.01
R605 1/2R330
IC601 TDA2611A
M661 3P-12.5mm
V661 SPK-1351
P661 3P12.5mm
C623 220µ/25V
C602 M0.1
C601 470µ/25V
R601 P3.3
C605 1µ
C604 220
C606 22µ/25V
R602 P120
C607 M0.0068
R603 P1.8K
C608 1µ
C610 1µ
R604 P10K
Q602 2SC2878-A
D610 1N4148
+12V
+5V-2
EXT. VIDEO
RN05 PS68K
RV01 P150
VIDEO OUT
QV01 2SC17405 or2SC1815-Y
RV03 1/2R105
RV02 1R105
CV01 150µ/16V
RV04 P68
CV02 470µ/10V
RV05 P10K
D013 1N4148
RV06 P1K
DV01 1N4148
QV03 2SA933S.Q or2SA1015-Y
U24.7858
RV17 P1K
PL-10 LV01
CV03 0.01
QV12 2SC17405 or2SC1815-Y
QV11 2SC17405 or2SC1815-Y
QV10 2SC17405 or2SC1815-Y
DX04 1N4148
DX01 1N4148
DX03 1N4148
RX09 2.2K
RX10 P2.2K
RX08 P2.2K
2.0Vp-p
2.0Vp-p
+5V-2
R639 P68K
T103 TRF1077D
VIDEO DET 38.9MHz
34.47MHz
Q008
C152 56
C145 CH12
C168 0.01
R163 P6.8K
R162 P680
R176 P3.9K
R536 P1K
C620 2.2µ
C502 M0.01
C503 220µ/16V
PIN 4
S1GNAL-ON 7.6
NO S1GNAL 0
EXCEPT L-MODE
Z103 TCF1031 5.5MHz
6.0MHz
R179 P390
C161 100µ/10V
Q010 2SC17405 or2SC1815-Y
R180 P330
R181 P220
R182 P82
Q011
C162 56
C163 56
6.5MHz
L107 PL-12
Z105 TCF101 5.5-6M
Q111 2SC17405 or2SC1815-Y
R187 P22K
R188 P22K
R189 P1K
3.9
R186 P390
Q012
P39
2SA
or2
VOL
D111 1N4148
AFT
R191 1/2522M
VT
C449 2200
DA99 1N4148
+5V-1
D108 µPC574JL
+32V
C193 2.2µ
C190 0.01
RA34 1/4R12K
DA32 1N4148
C440 220
C439 B390
RA33 P220
RA28 1/4R3.9K
RA27 P33K
RA25 P33K
RA24 P2.2M
C437 M0.1
C442 M0.1
C443 M0.1
RA58 P2K2
RA36 P1K
Q025 2SC17405 or2SC1815-Y
RA66 P100K
D109 1N4148
128µsec
RA21 P68K
RA99 P560K
RA42 P10K
RA41 P10K
Q010 2SC17405 or2SC1815-Y
5V
0V
0.25µsec
3.5V
1.5V
EXT. VIDEO
INT. VIDEO
D601 1N4148
R667 P10K
11.4
11.5
C609 47µ/16V
Q604 2SA933S.Q or2SA1015-Y
D603 1N4148
D602 1N4148
Q606 RN2904
DA02 1N4148
EXT.MUTE
RA76 P10K
RA78 P1K
DA03 1N4148
0.7V
-4.0V
63.5µsec
RA06 P10K
RA51 P10K
RA02 P10K
RA65 P10K
QA03 2SC17405 or2SC1815-Y
QA04 2SC17405 or2SC1815-Y
RA03 P10K
RA07 P4.7K
CA01 B100
HD
VD
VOL
CONT
BRT
COL
D203 1N4148
R212 P18K
D201 1N4148
R203 P47K
D503 1N4148
R574 P15K
D505 1N4148
R542 P15K
Z401 0.01 X4
(BLOCK CAP)
CE22 1µ
R509 P43K
+5V-1
+32V
AFT
+5V-2
RV30 PS80
RV29 PS80
RV24 P620
RV25 P620
TV VIDEO
ICA01 SAA5290
SHIELD
FL/AFT
DATA(MEMORY) SDA
CLOCK(MEMORY) SCL
AM/FM
RMT
IDENT
VDDM
RESET
XTAL OUT
XTAL IN
OSC GND
VDDT
VDDA
V.BLK. IN
H.BLK. IN
VDS
R OUT
G OUT
B OUT
RGB REF
COR
VSSD2
FRAME
VT
VOLUME
MUTE
COLOUR
CONTRAST
Y-MUTE
BRIGHT
SYSTEM
AFC
21PIN
KEY
VIDEO/TV(OD)
VSSD
BAND 1
EXT-MUTE
BG/I OR
BG/IDK
POWER
BAND 2
GND
CVBS0
CVBS1
BLACK
IREF
VSSA
U/V
RA92 PL7N
RA91 P1K
RA45 P10K
DA20 B100
RA96 P12K
RA90 P10K
RA97 P1.5K
QA08 2SC17405 or2SC1815-Y
RA86 P10K
RA88 P10K
CA18 0.01
CA19 0.01
4.7µ/16V
IC402 NM24C02EN
DATA
CLOCK
GND
Vcc
CA16 0.01
CA66 56P
CA65 56P
XA01 12M
LA04 TEH2011
LA05 TEH2011
CA47 0.01
CA48 0.01
LA03 TEH2011
LA02 PL-1
DA01 UZ6.2B5B
CA14 0.01
RA64 P10K
RA40 P1K
C444 47µ
RV26 P39
RV27 P39
RV28 P39
RA72 P20K
RA71 P6.8K
RA70 P3.3K
RA60 P330
RA61 P10K
CA50 4.7µ
RE01 P390
SA04 SA03 SA02 SA01
PUSH SW
POS UP
POS DN
VOL UP
VOL DN
K901 IR-9109A-K
GND Vcc Vout
DE50 STAND BY (RED) SCL003URC3FX
RA49 P15K
CA51 100P
RA54 P4.7K
RA61 P39470
RA53 P10K
RA17 P470
RA57 P10K
RA65 P10K
RA55 P470
CA22 0.1
CA23 0.1
CA24 0.1
RA37 P27K
5V
0V
0.7V
0V
C808 470/1(AC250V)
C807 470/1(AC250V)
DB01 LB-156 LF-8
R872 5W4.7
C809 120µ(400V)
C802 .1002(AC400V)
C803 1000(AC400V)
R803 P1.5M
S801 POWER SW.
T801 TRF5139
CB01 TD.221AC250V1 S/N.240823638
R801 1/2R2.2M(HIGH-OHM)
CAUTION LIVE AREA
F801 T5.0A 250V
RB96 PTC180HM
P802 2P(black)
P803 2P(WHITE)
L901 T5B-2333AR DEGAUSING COIL
BROWN
BLUE
P801 AC CORD(2P) AC 220-240V (LIMIT VOLTAGE) 50/60Hz
IC801 STR58041
450V 600V
-41.0 0.2 -35.2
LB11 TEH2011
Q802 2SA1020-Y(C) 2SC2655-Y(C)
D812 BYD33J
R806 2R47
R807 2R33
R808 1/2PR15
D813 1N4148
D810 BYD33J
R819 1/2R5.6
R810 P560
R809 P560
D811 1N4148
C814 M0.022
B1800
C817 22µ/10V
R844 1R8.2M
C844 2200
-41.8
Q804 2SC17405 or2SC1815-Y
Q805 2SC17405 or2SC1815-Y
Q806 2SC17405 or2SC1815-Y
R814 P1K
R815 P560
R816 P10K
R818 P1K
D815 1N4148
D816 UZ2.2B5A
C816 47µ/16V
R812 P47.0.3
R813 P560
D814 UZ5.6B5B
D819 UZ5.2B5B
RB11 1R0.2T
T803 SMT4 102367/90
PRIMARY CIRCUIT
SECONDARY CIRCUIT

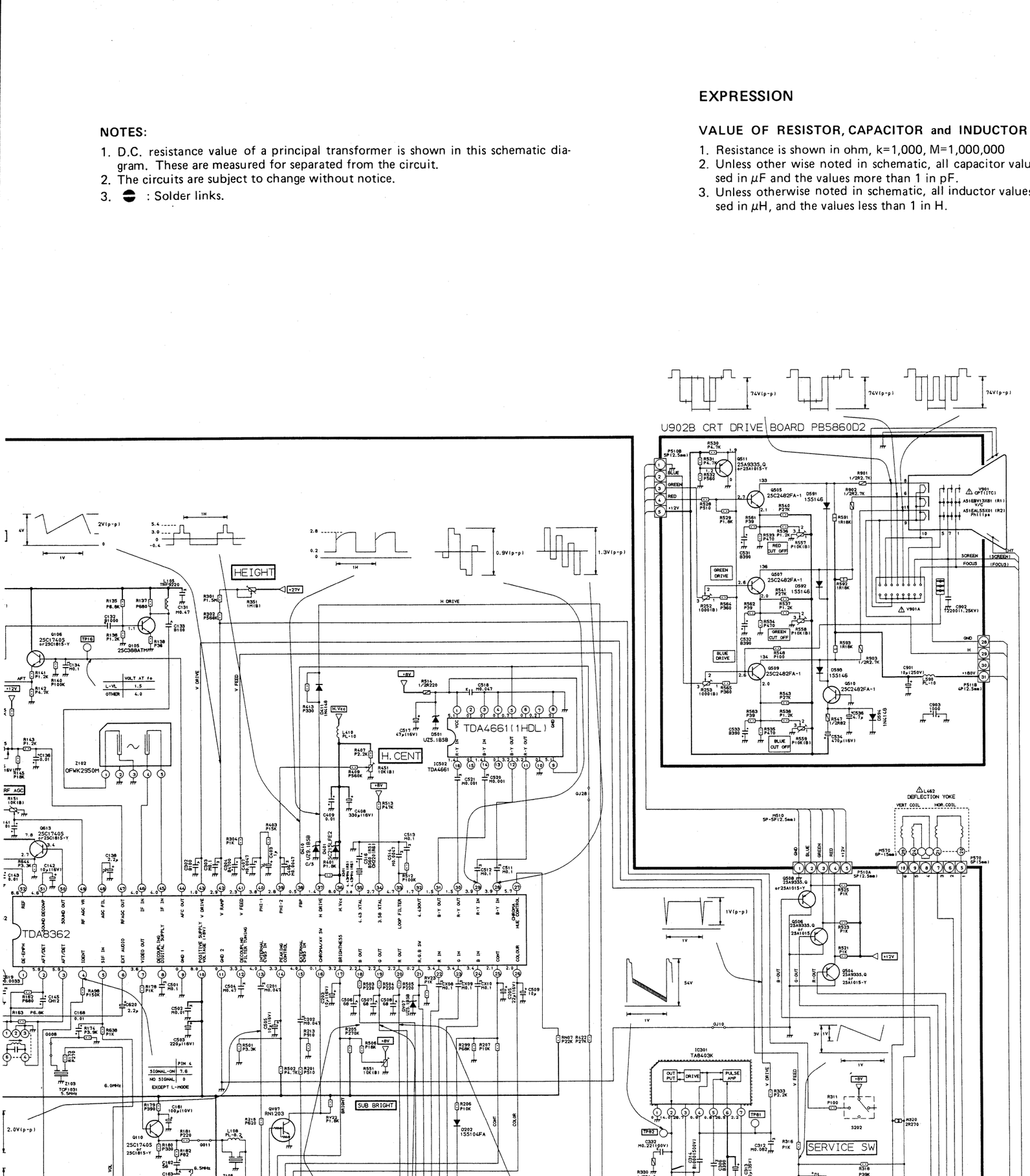
NOTES:

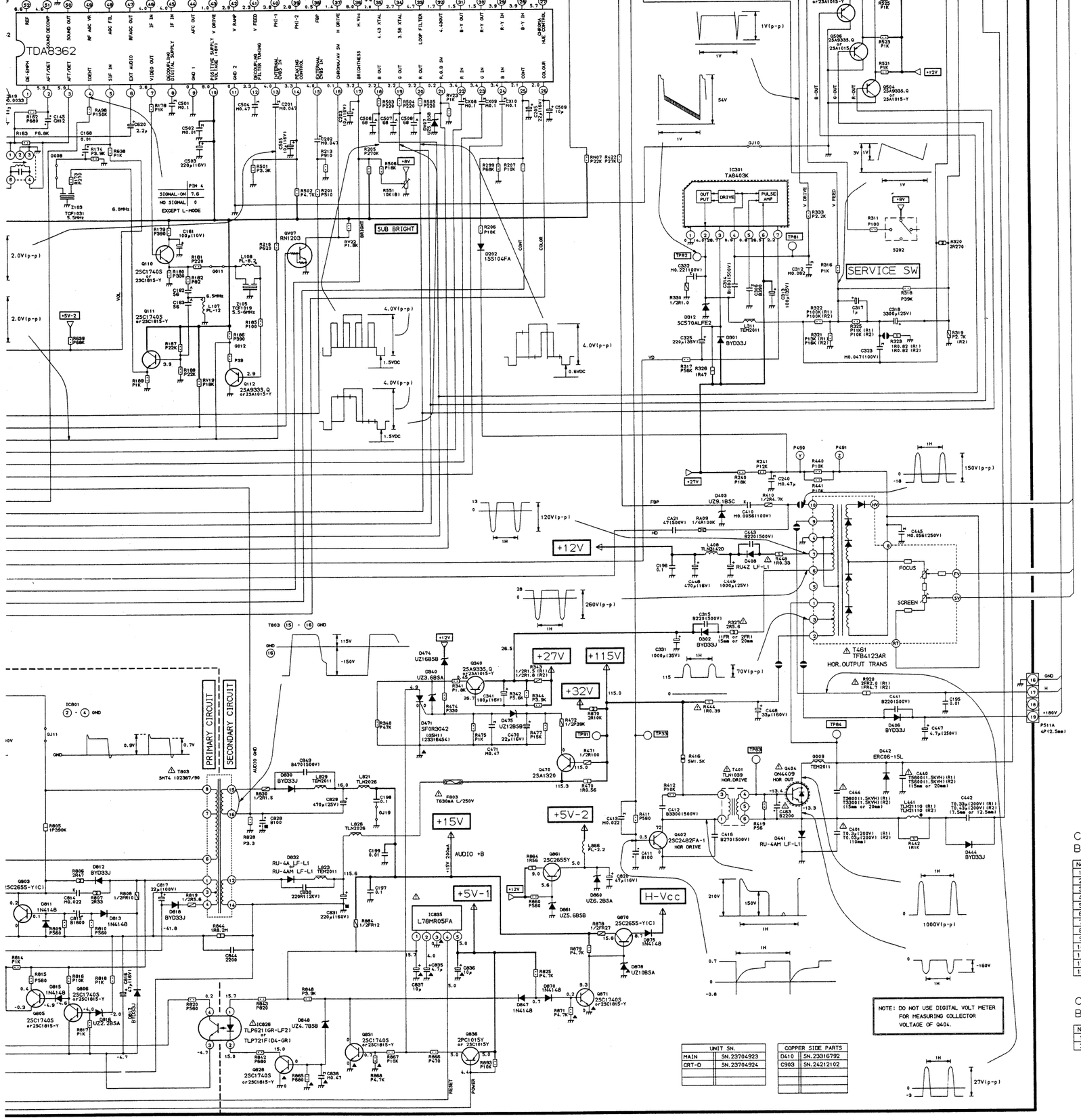
1. D.C. resistance value of a principal transformer is shown in this schematic diagram. These are measured for separated from the circuit.
2. The circuits are subject to change without notice.
3. ⬬ : Solder links.

EXPRESSION

VALUE OF RESISTOR, CAPACITOR and INDUCTOR

1. Resistance is shown in ohm, k=1,000, M=1,000,000
2. Unless other wise noted in schematic, all capacitor values less than 1 are expressed in μF and the values more than 1 in pF.
3. Unless otherwise noted in schematic, all inductor values more than 1 are expressed in μH, and the values less than 1 in H.





UNIT SN.	
MAIN	SN.23704923
CRT-D	SN.23704924

COPPER SIDE PARTS	
D410	SN.23316792
C903	SN.24212102

C4ER CIRCUIT SPEC COMPONENT VALUES BY CPT TYPE

No.	Loc.No.	R1	R2
1	V901	A51EAL55X01(PHILIPS)	A51EBV13X81(VIDEO COLOR)
2	C401	T0.03μ(200V)	T0.03μ(200V)
3	C440	T5600(1.5KVH)	T5600(1.5KVH)
4	C442	T0.43μ(200V)	T0.43μ(200V)
5	C444	T3600(1.5KVH)	T3300(1.5KVH)
6	L441	TLN2111G	TLN2111G
7	R920	1FR4.7	2FR2.0
8	R321	P13K	P16K
9	R322	P100K	P100K
10	R323	1R0.82	1R0.82
11	R325	P11K	P10K
12	R319	NOT REQ'D	1/2R1.5K
13	R343	1/2R1.5	1/2R1.8

C4ER CIRCUIT SPEC COMPONENT VALUES BY CRYSTAL TYPE(SUPPLIER)

No.	Loc.No.	R5	R6
1	X501	4.43MHz (N.D.K.)	4.43MHz (PHILIPS)
2	C516	B560	CH220

SPECIFICATIONS

Input Power Rating:	73 watts, AC 220 volts, 50 Hz
Aerial Input Impedance:	75 ohm unbalanced type for VHF, UHF and CATV
Receiving Channels:	**PAL-B/G Standard:** VHF ..... channels 2 to 4, 5 to 12 and S1 to S20 UHF ..... channels 21 to 69
Intermediate Frequencies:	Picture I-F carrier frequency ..... 38.9 MHz Sound I-F carrier frequency ..... 33.4 MHz Colour sub-carrier frequency ..... 34.47 MHz
Picture Tube:	21 inches, A51EFS43X69, 510 mm (measured on diagonal of viewable picture area), 90° deflection
Sound Output:	1.5 watts (at 10% harmonic distortion) x 1
Speakers:	77 mm round 1 pc
Aux. Terminals:	Headphone Jack, 21 pin socket (FULL), A/V INPUT socket
Dimensions:	Height ..... 476 mm Width ..... 530 mm Depth ..... 485 mm
Mass:	19.7 kg

Specifications are subject to change without notice.

TOSHIBA CORPORATION
1-1, SHIBAURA 1-CHOME, MINATO-KU, TOKYO 105-01, JAPAN